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The effects of press freedom and biotech policy on Southeast Asian newspapers' coverage of genetically modified crops

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**The effects of press freedom and biotech policy on
Southeast Asian newspapers' coverage of genetically modified crops**

by

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A thesis submitted to the graduate faculty
In partial fulfillment of the requirement for the degree of
MASTER OF SCIENCE

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Program of Study Committee:
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TABLE OF CONTENTS

List of Figures	iii
List of Tables	iv
Abstract.....	v
Chapter 1. Introduction and Problem Statement.....	1
National biotech policy.....	7
Chapter 2. Literature Review and Theoretical Framework.....	10
Agricultural biotechnology and developing countries.....	10
Framing GM Risk.....	11
GM policy in Southeast Asian countries	12
Agricultural biotechnology and the ASEAN region.....	16
Press freedom in Southeast Asia	25
Media coverage of agricultural biotechnology and GM crops	34
Chapter 3. Method	41
Secondary data	41
Content analysis	42
The sample.....	43
Variables and their measurement.....	46
Data analysis	50
Intercoder reliability	51
Chapter 4. Results and Discussion	52
Intensity of Coverage.....	52
Themes or Frames	54
Tone	57
Sources cited.....	62
Press Freedom as a Determinant of Newspaper Performance	68
National Biotech Policy as Determinant of Newspaper Performance	72
Chapter 5. Conclusions.....	76
Implications of the Findings to Theory and Professional Practice.....	79
Limitations of the Study and Suggestions for Future Research.....	82
Appendix A	85
Appendix B	86
References	90
Acknowledgments.....	103

LIST OF FIGURES

Figure 1. The study's conceptual framework.....	40
Figure 2. Number of articles published per country.....	53
Figure 3. Average length of articles per country	53
Figure 4. Tone of articles per country	61
Figure 5. Sources cited in the six newspapers combined	63
Figure 6. Top sources cited in the articles per country.....	65
Figure 7. Average number of sources cited per country	66

LIST OF TABLES

Table 1. National policy options toward GM crops (Paarlberg, 2000)	14
Table 2. Intercoder reliability results	51
Table 3. Average number of themes or frames used per story per country	54
Table 4. Distribution of use of themes per country	58
Table 5. Chi-square tests comparing the six SE Asian countries in terms of frame use	60
Table 6. Chi-square test comparing the difference among the six SE Asian countries in terms of the tone of the newspapers' GM coverage	62
Table 7. Chi-square test comparing the difference among the six SE Asian countries in terms of the sources cited in the newspapers' GM coverage	67
Table 8. Results of a multivariate analysis of covariance test showing the influence of press freedom on number of stories and average length of stories	69
Table 9. Means and standard deviations for number of stories and average length of stories	69
Table 10. Results of a multivariate analysis of covariance test showing the influence of press freedom on number of frames used and sources	70
Table 11. Means and standard deviations for number of sources and number of frames used in countries with differing press freedom status	71
Table 12. Chi-square test showing differences in tone of coverage according to a nation's degree of press freedom	71
Table 13. Results of multivariate analysis of covariance tests showing the influence of national biotech policy on story length, number of frames used and sources cited	72
Table 14. Means and standard deviations for number of sources and number of frames used in countries according to biotechnology policy	73
Table 15. Chi-square test showing differences in tone of coverage according to biotechnology policy	75

ABSTRACT

This study determines whether a country's degree of press freedom and national biotech policy influence its newspapers' performance in reporting about GM crops. Using the tenets of social amplification of risk framework, agenda setting, and framing theory, a content analysis of articles from newspapers in the Southeast Asian countries of Cambodia, Indonesia, Malaysia, Philippines, Thailand and Vietnam was conducted.

Results reveal that a freer press status fosters more stories and use of frames while a precautionary biotech policy favors the citing of more sources. The diversity of sources, however, produced a more polarized coverage that tended to be negative toward this innovation. Across the nations, the most dominant sources cited were politicians and government institutions followed by international and local NGOs. The top frames were those that discussed policy/legal issues, safety issues, and food security.

CHAPTER 1. INTRODUCTION AND PROBLEM STATEMENT

World food production is always playing catch-up with rapid population growth. Drought, low-yielding crop varieties, pests and diseases, poor soils, low fertilizer use, lack of irrigation, and limited access to modern technologies are among the problems that plague agriculture especially in developing nations. These persistent challenges have prompted scientists to experiment with genetic modification (GM), a technique that allows the introduction of genetic material from one type of organism to another, in order to improve crop production and crop quality. Touted as a transformative technology that would limit production losses, protect yields, and contribute to food security, agricultural biotechnology was expected to create more gains than those scored through the Green Revolution. Billions of dollars have been spent on research and development efforts related to GM crops (Hallman, 2009).

More than 15 years since their introduction in 1996, GM crops have been adopted by farmers worldwide at a surprising rate. Biotech hectareage increased by 10% or 14 million hectares between 2009 and 2010, the second highest annual growth in terms of land area, bringing global plantings to 148 million hectares (James, 2010). As Resurreccion (2011) reports, by 2010, biotech crops were being grown in a billion hectares by 15.4 million farmers from 29 countries. These countries, according to James (2010), represent 59% of the world's population. Notably, 19 of these 29 countries are developing nations whose areas devoted to GM crops grew at a rate of 17% or 10.2 million hectares by 2009, compared to only

a 5% growth (3.8 million hectares) over the same time span in industrialized countries (James, 2010).

Farmers' receptiveness to GM crops can be attributed to the promise that is associated with agricultural biotechnology since its emergence. Among others, it showed great potential to address hunger, increase yield and income, as well as develop better products preferred by consumers in developed and developing nations. Consequently, the technology continues to be a newsworthy topic. As Hepeng (2007) observes, "the technology has always attracted scepticism, resistance and controversy, yet its use continues to grow in many parts of the world" (para. 5). Indeed, genetic modification remains a contentious topic, spurring national debates around the globe about its benefits and potential risks.

According to MacKenzie (2002), much of the discussions about GM technology has occurred in developed countries and revolved around complex technical issues mainly related to potential risks to human health. Other countries, however, have different concerns. Asian nations, for example, are more inclined to think about the impact of the technology on their export markets, food security, and biodiversity (MacKenzie, 2002). These concerns, influenced by these countries' economic and socio-political realities, often become the basis for the development of domestic policy postures on GM crops that may differ from those enunciated by Western countries or industrialized nations. Nowhere has the debate about this topic involved more rancor as it has been in Southeast Asia.

Diversity characterizes Asia. Some of its countries rank at the top in terms of gross domestic product (GDP); other less developed and smaller nations (e.g.,

Afghanistan, Nepal, Bhutan, East Timor, Laos, Cambodia, and Bangladesh) are at the bottom and are overshadowed by neighbors that demonstrate faster economic growth (de Beer and Merrill, 2009). Countries across the continent also have different types of government that promote or restrict the degree of freedom their media systems enjoy and the kind of policy they adopt to develop agriculture, including the application of genetic engineering.

Diversity is even more evident in Southeast Asia where numerous languages, political systems, and national economic status exist partly attributable to a rich history. In this part of the continent, the majority derive their livelihood directly or indirectly from agriculture. After the surge of the so-called Green Revolution, “commercial cash crops have become progressively more important as increasing numbers of farmers have been incorporated into national and international market economies directed toward the needs of expanding urban populations” (Capistrano and Marten, 1986, p. 7).

To promote economic cooperation and the welfare of the people in the region, the Association of Southeast Asian Nations (ASEAN) was established on August 8, 1967. The ten members of ASEAN (Indonesia, Malaysia, the Philippines, Singapore, Thailand, Brunei Darussalam, Vietnam, Cambodia, Laos and Myanmar) have three main objectives: “to promote the economic, social and cultural development of the region through cooperative programs; to safeguard the political and economic stability of the region against big-power rivalry; and to serve as a forum for the resolution of intra-regional differences” (ASEAN, n.d.).

These goals are pertinent considering that the region is faced with major

development challenges: a burgeoning population always threatened by food insecurity, grinding poverty, massive unemployment, and environmental degradation, among others (ASEAN, n.d.). To feed their growing population, some member states have expressed a keen interest on agricultural biotechnology and have experimented with GM crops such as corn, rice, soybeans, and potatoes. The Philippines, for instance, was the first in the region to allow the commercialization of the corn borer-resistant Bt corn in 2002, while Indonesia was the first Southeast Asian country to produce GM crops on a commercial scale by planting Monsanto's Bt cotton to 4,000 ha in South Sulawesi province (Hautea & Escaler, 2004). Thailand, on the other hand, has used biomarker selection to produce virus-resistant GM papaya as well as salt- and drought-tolerant transgenic rice (Chaturvedi & Srinivas, 2010). Similarly, Malaysia has been successful in producing GM rice resistant to the highly destructive tungro virus¹ and the ring spot virus-resistant GM papaya at the experimental stage (GAIN, 2011). Other crops, such as pineapples have also been manipulated to resist "black heart" disease². After a successful field trial of GM corn in the northern province of Vinh Phuc, Vietnam prepares for large-scale growing of GM crops in 2012 (*Viet Nam News*, 2011). Cambodia admits it is

¹ Tungro is one of the most damaging rice diseases in Southeast Asia. Yield losses of up to 100% have been reported, and the disease is spreading in the region. It is a co-infection involving the rice tungro bacilliform virus and rice tungro spherical virus. Symptoms include leaf discoloration, stunting, reduced tillering, and reduced grain production. All growth stages of rice are susceptible, but losses are higher for infections early in the growth cycle. Tungro is transmitted by leafhoppers, including the zigzag leafhopper and the green leafhopper (AgroNews, 2010).

² Black heart, an unsightly discoloration, is a major postharvest quality defect of pineapple that develops inside the fruit during cool weather cultivation or cool storage, and affects the availability and quality of pineapples for fresh market and processing (ACIAR, 2005).

not capable of developing any GMO in the near future because of its limited capacity in biotechnology, but is more likely to be a user of GM products (Napompeth, 2011; Chaturvedi & Srinivas, 2010).

The move toward GM crops, however, has been greeted by vehement protests from various stakeholders and interest groups. In a report on the continuing GM debate in the region, MacKenzie (2002) observes that “while consumers are split into disparate groups, overall attitudes remain cautious and negative towards GM foods” (p. 2).

Kasperson et al. (1988) explain that the public’s perceptions of risk and, by extension, their attitudes toward a risk issue or risk event, are influenced by various “amplifiers,” such as organizations and cultural groups, government agencies, and the news media. As their social amplification of risk framework (SARF) stipulates, the quality and quantity of information the public receives can attenuate or amplify public perception of a risk situation (Kasperson et al., 1988). Specifically, SARF takes into account “the public’s interpretation and response to information flows from the media, which is one of the primary risk amplification mechanisms” (p. 185). Also emphasized in SARF is the media’s role as gatekeepers of scientific and risk information.

Press freedom

Risk communication experts such as Sandman and Lanard (2003) emphasize that when it comes to risk issues, the public relies primarily on the media for information. However, according to Dunwoody (1992), “when it comes to risk coverage, the mass media are regularly accused of bias, sensationalism,

inaccuracies, indifference, and of being simplistic and polarized” (p. 75). These biases result not just because of individual characteristics of reporters and journalists, but are also rooted to contextual factors. These contextual factors include the media’s ability to report risk issues and the freedom they have to perform this task.

Organizations such as Freedom House have been established to track, evaluate and promote media freedom throughout the world. Freedom House uses three main categories (legal, political, and economic environment) to measure the degree of press freedom that prevails in each country. The legal environment dimension focuses on the laws and legal institutions that restrict the operation of the media. The political environment aspect involves an examination of the government’s control over the media. The economic environment dimension encompasses the structure of media ownership, media concentration, and market for advertising revenue (Becker & Vlad, 2009). After taking the sum of the scores in these three categories, Freedom House ranks a country’s press freedom as “not free,” “partly free,” or “free.”

Since 1996, the state of press freedom in several SE Asian countries has varied, except for Malaysia and Vietnam, which have been consistently ranked as “not free.” These countries are, in general, under strict government control, which has severely affected the freedom of the media to operate. This “dangerous atmosphere,” according to Freedom House (n.d.), impedes the flow of objective and balanced information to and from the public.

Although scholars have examined the effects of individual characteristics of journalists and reporters as well as organizational constraints on media performance to explain the quality of media coverage of issues (e.g., Kitzinger and Reilly, 1997; Dunwoody, 1992; Peters, 1994; Brunkens, 2006; Kalaitzandonakes, et al., 2004), few have analyzed the influence of press freedom on the communication of science and risk topics (e.g., Xiang, 2007). Also, as Kasperson et al. (2003) lament, the existing empirical studies on risk using SARF mainly reflect the North American experience. After more than 15 years, there is a need to test the propositions of SARF (and most theoretical frameworks produced from the West) in different cultural and political contexts.

This study addresses this call for a wider application of risk communication theories in different milieus, specifically to the Southeast Asian condition. Does the degree of press freedom influence news coverage about GM crops? Is there a correlation between the degree of press freedom and intensity of coverage, frame richness, and valence of the stories toward GM crops?

National biotech policy

The extent to which genetic engineering is promoted or impeded in a particular country depends largely on government policies. Governments differ in the level of support they assign to genetic engineering. There are countries that permit GM technology and there are places where farmers are not allowed to even pilot-test GM crops because of serious concerns about biosafety (Paarlberg, 2002).

According to Paarlberg (2001), there are four potential national policy postures regarding GM crops based on intellectual property rights, biosafety, trade,

food safety, and consumer choice and public research investment. These national postures may be (1) promotional, (2) permissive, (3) precautionary, and (4) preventive depending on the extent to which each nation is concerned with food insecurity, protection or expansion of export markets, and the opinions of consumers (MacKenzie, 2002).

This study also aims to determine the policy stances regarding GM of six Southeast Asian countries (Cambodia, Indonesia, Malaysia, Philippines, Thailand, and Vietnam) known as “the food baskets of Southeast Asia,” and ascertain whether such policy statements have a bearing on the way GM crops are reported by their respective news media. Is there a correlation between GM policy and the intensity of coverage, frame richness, and valence of the stories toward GM crops?

The findings of this study are expected to contribute to the further development of the social amplification of risk framework developed by Kasperson and colleagues in 1988 by determining its applicability to the Southeast Asian context. It also aims to provide insights as to the potential impact of two socio-cultural variables, (1) existing GM policy and (2) degree of press freedom, on press reports about GM crops. The findings are expected to help communication practitioners widen their perspectives on issues concerning risk reporting in Southeast Asian countries. Furthermore, the results are meant to assist policymakers in formulating and enhancing GM policies.

According to Bhatt (2005), “the public sector is a viable, but a largely unproven, player in [the] bioengineering of local crops” (p. 21); it is therefore important for them to be aware, be informed and make sound decisions about how

to handle this controversial technology. The findings of this study are expected to provide insights on how GM crops are portrayed in SE Asia and give the public a general sense of the status of GM technology in these countries.

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Agricultural biotechnology and developing countries

Biotechnology has long sparked debates between and among the developed countries of North America and Europe that have adopted contradictory positions regarding genetically modified crops (Frewer et al., 2002; Paarlberg, 2000; Fischhoff & Fischhoff, 2001; Poortinga & Pidgeon, 2001). Often left out of these debates, developing nations have taken a closer look at agriculture biotechnology to address the pressing problems of food production and poverty alleviation (Aerni, 2001; Zepeda, 2006; Mackenzie, 2002; Curtis 2004).

GM crops have been grown commercially since 1996 (Paarlberg, 2001; James 2010). For the past 15 years, areas planted to GM crops have increased significantly (James, 2010). The largest proportion of these areas is dedicated to maize, cotton, soybeans, and canola. What are now considered as the 29 biotech “mega-countries” (those planting 50,000 hectares or more to GM crops) include China, India, Brazil, Argentina and South Africa (James, 2010). As James (2010) reports, “developing countries grew 48% of global biotech crops in 2010; they will exceed the production of industrial countries before 2015. Growth rates are also faster in developing countries than in industrial countries” (para. 17).

Despite a more open attitude toward genetic engineering compared to their western counterparts, developing nations also differ in their views about and expectations of biotechnology. Some are averse to risk (Zepeda, 2006; Paarlberg, 2001; Gruere and Sengupta, 2009). Some worry about the influence of multinational corporations, international traders and importers, and activist groups on public

attitudes toward GM crops (Paarlberg, 2000; Zepeda, 2006; Aerni, 2001; Phillips, 2001; Gruere and Sengupta, 2009). Because the vibrance of the scientific enterprise depends on public support, determining public reactions to the introduction of a scientific innovation is of concern to policy makers. The more astute decision makers recognize that how science is covered by the mass media has a discernible impact on public perception.

Framing GM Risk

When it comes to the public's perception of risk, several researchers have stressed the profound influence of the media (Xiang, 2007; Kasperson et al., 1992; Renn, 1991). Indeed, the media both reflect and influence public perceptions of what constitutes a hazard and how serious the associated risks are by selecting certain issues for attention and by the kind of information they provide about risk events (Singer & Endreny, 1995). Renn (1991) posits that the volume or intensity of coverage alone has a direct bearing on public perceptions of risk.

Tuchman (1977) was first to recognize the vital role framing plays in the media's news gathering and the audience members' news processing, suggesting that the "media use frames to construct social reality for audiences and thus give meaning to words and images" (Brunkens, 2006, p. 10). Thus the media help shape people's understanding and perspective on the topics in the news.

Analyzing earlier studies on news frames, Scheufele (1999) explains that when media frames are explored as dependent variables, it involves looking at social norms and values, organizational pressures and constraints, pressures from interest groups, journalistic routines, and ideological or political orientations of

journalists that may potentially influence how journalists frame a given issue. Aside from these factors, this study posits two more independent variables that may have a bearing on the development and deployment of media frames: (1) a country's degree of press freedom and (2) national policy with respect to biotechnology.

GM policy in Southeast Asian countries

Paarlberg (2000) points out that poor countries are the real stakeholders in the adoption of GM technology because it is in those countries where sizeable gains can be realized and distinctive perils are more explicitly identified. The developing world, he explains, stands to benefit more from GM technology because agriculture in tropical countries is a more difficult enterprise compared to agriculture in the temperate zones. In developing countries, poor soils, extreme moisture, heat and drought, and high incidences of pests and parasites can lead to massive crop losses not often encountered in the Western world (Paarlberg, 2000; Phillips, 2001; Zepeda, 2006).

The majority of farmers and consumers in developing countries are neither wealthy nor well-fed, and governments possess different scientific and institutional capacities to test and/or manage biotech crops. The policy stance they take regarding biotechnology will have to answer their own problems and respond to their own exigencies. For them, the highly precautionary approach of Europe may cost too much in terms of farm productivity while the industry-driven approach of the U.S. could put biosafety and equity at risk (Paarlberg, 2000; Zepeda, 2006).

Previous studies (e.g., Bhatt et al., 2005; Paarlberg, 2001; Zepeda, 2006) have looked into the policies and regulations governing genetically modified crops in

Asia. Evidently, they found variations in policies and the degree to which governments are willing to refine and implement them.

Fear of losing export revenues has discouraged many Asian countries from testing and/or approving new GM food crops despite the improvements they promise (Gruere, 2006; Mackenzie, 2002; Phillips, 2001). With respect to GM policy, these countries have three alternatives: (1) to allow the production of GM food crops with the risk of losing potential exports, (2) to reject the commercialization of any GM food crop, or (3) to produce both GM and non-GM crops separately at a marketing cost (Gruere, 2006).

Paarlberg (2000) presents an analytic framework for classifying the policy choices open to developing countries with regard to crop biotechnology (Table 1). These policy choices are based on five parameters or dimensions: intellectual property rights (IPR), biosafety, food safety and consumer choice, trade, and public research investment. The four policy postures that emerge are: (1) “promotional” or policies that accelerate the spread of GM crop and food technologies within the borders of a nation, (2) “permissive” or policies that are neutral toward the new technology, (3) “precautionary” or policies intended to slow the spread of GM crops and foods for various reasons, and (4) “preventive” or policies that tend to block or ban entirely the spread of this new technology (Paarlberg, 2000).

Paarlberg (2000) explains that governments may select from these choices depending on the size, ecological endowment, research capacity, trade posture, or the distinctive agricultural and rural development challenges they face. For example, some developing countries with significant unsolved agricultural development or

food security problems might be expected to take at least a permissive view of GM crop technologies because of concerns regarding biosafety.

Table 1. National policy options toward GM crops (Paarlberg, 2000)

Policy areas	National policy posture			
	Promotional	Permissive	Precautionary	Preventive
Intellectual Property rights	Full patent protection, plus plant breeders (PBRs) under the UPOV 1991*	PBRs under UPOV 1991	PBRs under UPOV 1978, which preserves farmers' privileges	No IPRs for plants or animals or IPRs on paper that are not enforced
Biosafety	Only token screening or approval based on approvals in other countries	Case-by-case screening primarily for demonstrated risk, depending on intended use of product	Case-by-case screening also for scientific uncertainties owing to novelty of the GM process	No careful case-by-case screening; risk assumed because of GM process
Trade	GM crops promoted to lower commodity production costs and boost exports; no restrictions on imports of GM seeds or plant materials	GM crops neither promoted nor prevented; imports of GM commodities limited in same way as non-GM in accordance with science-based World Trade Organization (WTO) standards	Imports of GM seeds and materials screened or restrained separately and more tightly than non-GM; labelling requirements imposed on import of GM foods or commodities	GM seed and plant imports blocked; GM-free status maintained in hopes of capturing export market premiums

Table 1. (continued).

Policy areas	National policy posture			
	Promotional	Permissive	Precautionary	Preventive
Food safety and consumer choice	No regulatory distinction drawn between GM and non-GM foods when testing or labelling for food safety	Distinction made between GM and non-GM foods on some existing food labels but not so as to require segregation of market channels	Comprehensive positive labelling of all GM foods required and enforced with segregated market channels	GM food sales banned or warning labels that stigmatize GM foods as unsafe to consumers required
Public research investment	Treasury resources spent on both development and local adaptations of GM crop technologies	Treasury resources spent on local adaptations of GM crop technologies but not on development of new transgenes	No significant treasury resources spent on either GM crop research or adaptation; donors allowed to finance local ad adaptations of GM crops	Neither treasury nor donor funds spent on any adaptation or development of GM crop technology

*International Union for the Protection of New Varieties of Plants (UPOV).

The biotech policies particularly of developing countries are strongly influenced by their agricultural trading partners and established export markets. For instance, Kenya and India have highly cautious national biosafety policies that requires farmers to seek official permission to grow GM crops. These countries always have an eye on the potential negative reactions from export markets that have been known to eschew GM products.

Developed nations, on the other hand, apply international regulations in different ways. The most stark contrast is between the European Union and the United States. According to Gruere (2006), “EU regulations follow an approach based on the precautionary principle and consumers’ “right to know,” with stringent approval, labeling and traceability standards on any food produced from or derived from GM ingredients” (p. 2). In contrast, the U.S. has always implemented a highly promotional policy that considers GM products as substantially equivalent to their non-GM counterparts.

China is another country that has taken a permissive posture (Paarlberg 2000). Chinese authorities encourage the production of GM crops as a “buffer” measure meant to insulate the country from the adverse effects of internal and external crises

Agricultural biotechnology and the ASEAN region

The Southeast Asia region consists of ten countries, namely the Philippines, Indonesia, Singapore, Malaysia, Thailand, Cambodia, Laos, Vietnam, and Myanmar (also called Burma). Aside from its geography, this region is united by regional trade and business cooperation promoted by its regional alliance, the Association of Southeast Asian Nations (ASEAN).

ASEAN was established in 1967 as a response to communist insurgencies in Indochina and Malaysia (McDaniel, 2002). It was started by five member countries (Indonesia, Malaysia, the Philippines, Singapore and Thailand) that were later joined by the remaining five countries in the region—Brunei Darussalam in 1984, Vietnam in 1995, Laos and Myanmar in 1997, and Cambodia in 1999 (ASEAN, n.d.). ASEAN

aims to “accelerate economic growth, social progress and cultural development in the region through joint endeavors; promote peace as well as an active and effective collaboration within and outside the region to expand trade, improve transportation and communications facilities, and raise the living standards of people” (ASEAN, n.d.).

According to Napompeth (2010), ASEAN countries are, to a very large extent, aware of and technically concerned with the development and advancement of modern agricultural biotechnology both globally and within the region. All are parties to the Convention on Biological Diversity (CBD), and eight of its member-countries (excluding Brunei Darussalam and Singapore), are also parties to the Cartagena Protocol on Biosafety (CPB).

The six ASEAN member-nations analyzed in this study can be divided into two groups based on their GM and biosafety policy options. The first group is composed of countries that have yet to develop a policy on GMOs (Cambodia and Vietnam); the second group (Indonesia, Malaysia, the Philippines, and Thailand) includes those with existing regulatory policies with respect to GMOs (Bhumiratana, n.d.).

Cambodia is a highly agricultural country that recognizes the critical role GM crops play in its “strategic triangle” of objectives: economic growth, social development, and sustainability. However, Cambodia is not yet capable of developing any GMO, although it is more likely to be a user of GM products. Its National Biodiversity Steering Committee under the Ministry of the Environment says the main policy goals for Cambodia are: (1) to develop biotechnology education

while preventing or minimizing environmental risks and health hazards that may be associated with the use and release of GMOs, and (2) to protect indigenous biodiversity from adverse impacts that may result from the introduction and use of GMOs. The country also espoused a priority need to fill gaps in technical, infrastructure, human resources and institutional capacities. Cambodia's National Biosafety Law and Sub-decree on the Management and Control of Living Modified Organisms has been drafted and is pending approval. The Cambodian Import and Export Inspection and Fraud Repression Department under the Ministry of Commerce is of the view that as long as the safety of GM food can be substantiated by scientific evidence, Cambodia sees no need to impose restrictions on GMOs (Nampompeth, 2010; Bhumiratana, n.d.).

Through Government Decree No. 18/CP passed in 1994, the government of Vietnam has assigned the highest priority to biotechnology research and views it as an increasingly important prerequisite to achieve the national goals and objectives for food, feed, and fiber production, health care, and environmental protection for the period 1995-2010 (Chaturvedi & Srinivas, 2010; Hautea & Escaler, 2004). On January 12, 2006, the Prime Minister signed Decree 11/2006/ND-TTg, specifying the "Key Programs and Application of Biotechnology in Agriculture to 2020" in which Vietnam expects to create new plant varieties, animal breeds and biotech products through the application of biotechnology. The objective is to enhance the competitiveness of Vietnam's agricultural and fishery products, both domestically and internationally. On May 31, 2007, Prime Minister Nguyen Tan Dung signed Decree No. 79/2007/QD-TTg, the action plan that covers all aspects of biological

diversity, including the management of GMOs and GM products through risk assessments, labeling, and monitoring, including the inspection of all GM organisms and products marketed in Vietnam by 2010. Chaturvedi & Srinivas (2010) see the country as undergoing a process of establishing biosafety norms. In line with this, Vietnam has formed a working group that drafted a biosafety bill now undergoing review by the Ministry of Science, Technology and Environment (Bhumiratana, n.d.). As Napompeth (2010) points out, even without a policy regarding the introduction of GMOs for direct use as food or feed, biotechnology development is advancing at a rapid rate in the country. The national policy is expected to encourage the application of biotechnology for agricultural production. In fact, a strategic “master plan” for biotechnology up to the year 2020 is being developed for nationwide implementation. To fast track this, the government plans to increase the budget for research and development programs, and invest in biotechnology infrastructure development. There are national plant quarantine systems being used to check any inadvertent introduction of GMOs and hazardous microorganisms into the country and to regulate the field trials of GM crops such as rice, maize, cotton, soybean, papaya, cabbage, cassava, sweet potato, potato, tomato, sugarcane, ornamental flowers (carnation, chrysanthemum, gladiolus) and forest trees (Nampompeth, 2010; ASEAN, n.d.). The country imports GM soybean and maize. It is still finalizing a food labeling regulation that imposes a mandatory threshold of 5% GM content in food products.

The Philippines is the only country in the region that has allowed the commercialization of GM crops after a series of biosafety regulatory assessments

(Zepeda, 2006). On April 3, 2002, supplementary guidelines were issued by the Department of Agriculture under Administrative Order 8 (DA AO 8) to set the policies for processing applications for the commercial propagation and importation of biotechnology materials. The Philippines is also one of the few developing countries with a functioning biosafety regulatory system. As early as October 1990, the country constituted the National Committee on Biosafety of the Philippines (NCBP) through Executive Order No. 430 (DA, n.d.). The NCBP conducts nationwide consultations using guidelines developed by the International Rice Research Institute and University of the Philippines at Los Baños as a working draft, and came up with the Philippine Biosafety Guidelines which were issued in 1991. Since 2004, the Program for Biosafety Systems has been working with key regulatory agencies and the NCBP to implement activities aimed at strengthening the country's biosafety system (IFPRI-PBS, n.d.). On March 17, 2006, Executive Order No. 514, Establishing the National Biosafety Framework (NBF), Prescribing Guidelines for Its Implementation, Strengthening the National Committee on Biosafety of the Philippines, and for Other Purposes, was enacted. Under this, the NBF shall be applied to the development, adoption and implementation of all biosafety policies, measures and guidelines and in making biosafety decisions concerning the research, development, handling and use, trans-boundary movement, release into the environment and management of regulated articles (DA, n.d.).

The Philippines has been ranked one of the mega-biotech countries with 0.4 million hectares grown to GM crops in 2008 and 0.5 million hectares devoted to GM corn in 2010 (Nampompeth, 2010; James, 2010). The country's policy aims to

promote the safe and responsible use of the products of biotechnology as a way of achieving and sustaining food security, providing equitable access to health services, maintaining a sustainable and safe environment, and industrial development (Nampompeth, 2010; Bhumiratana, n.d.).

Malaysia and Indonesia have drafted national guiding principles regarding the release of GMOs into the environment. Indonesia is the only country to have legal provisions on biosafety released under Ministerial Decree No. 85/kpts/HK330/9/1997 or the Provisions for the Biosafety of Genetically Engineered Agricultural Biotechnology Products passed in 1997 (Bhumiratana, n.d.). The regulation was revised two years later to become the Joint Decree of Four Ministries (Agriculture; Forestry and Estate Crops; Health; and Food & Horticulture) on the Biosafety and Food Safety of Genetically Engineered Agricultural Products. To date, the joint decree still has to include the Ministry of the Environment that represented the country in the signing of the Cartagena Protocol. In 2005, Indonesia promulgated the Biosafety Act to monitor activities relating to GMOs intended for direct consumption as food, feed or for processing.

Although biotechnology in Malaysia is still in its infancy, the country recognizes the immense potential benefits from the technology and is making every effort to improve its competitiveness in this area at the international level (Chaturvedi & Srinivas, 2010). As an indication, Malaysia's National Biotechnology Directorate (BIOTEK) was established in 1995 with seven Biotechnology Cooperative Centers on plant, food, animal, molecular biology, medical, environment, industry, and biopharmacy. A year later, the Genetic Modification Advisory Committee (GMAC) under

the National Committee on Biodiversity was established as a technical advisory committee to the Ministry of Natural Resources and Environment to conduct risk assessments (Bhumiratana, n.d.). "BioValley Malaysia" was set up to become a hub for research institutes on agricultural, genomics and molecular, pharmaceutical and nutraceutical biotechnology (Napompeth, 2010). In June 2002, GMAC drafted a Biosafety Bill to regulate and manage the import of GMOs, deliberate how they should be released into the environment, their placement on the market, and the contained use of GMOs and products derived from these organisms in accordance with the Precautionary Principle, the principle of sustainable development, and ethical and cultural norms, so as to protect human, plant and animal health, the environment and biological diversity (Hoh, 2011; Chaturvedi & Srinivas, 2010). In April 2005, Malaysia launched the 15-year National Biotechnology Policy (NBP) that provides a comprehensive framework for the development of biotechnology in the country. According to Chaturvedi and Srinivas (2010), "the main objectives of the NBP are to develop human resources to meet the industry's skills needs, to nurture entrepreneurship, and the development of niches in agriculture biotechnology, healthcare biotechnology, industrial biotechnology and bioinformatics" (pp. 50-51). In 2010, new biosafety regulations were set-up in which approval is required for any release, importation, exportation and contained use of GMOs. Although the regulations have been operational since November 1, 2010, a grace period of two years was given for noncompliance. Hoh (2011) reports that the strict mandatory labeling of food and food ingredients obtained through modern biotechnology will have implications on US food exports to Malaysia.

Thailand has proclaimed a national policy to adopt science and technology as tools with which to add value to agricultural products and for long-term economic development. The National Center for Genetic Engineering and Biotechnology (BIOTEC), established in 1983, has developed and implemented biosafety guidelines since 1992. The guidelines were last revised in 2004. BIOTEC prepared the National Biotechnology Policy Framework 2004-2009 while the Ministry of Agriculture and Cooperatives (MOAC) completed a Development of Agricultural Biotechnology Plan (2006-2009), including a road map for public participation, in discussions about GM issues. A National Biosafety Committee has been in place since 1993 with four subcommittees in charge of plants, microorganisms, food, and socioeconomic issues. This Committee postponed its activities in 2004 while awaiting the enactment of a biosafety law. In 2009, 33 Institutional Biosafety Committees have been formed through the Office of Natural Resources, Environmental Policy and Planning to oversee the CBD and the CPB, including the provision of a biosafety clearing house as part of the Cartagena Protocol (Napompeth, 2010).

Napompeth (2010) points out that even though national and domestic legislations to regulate biotechnology are already in place, there is still a need for proper inter- as well as intra-agency coordination and enforcement. A moratorium banning the field trials of GM crops until the biosafety law is in place was issued by the Cabinet as demanded by anti-GMO pressure groups in April 2001 (Nampompeth, 2010; Zepeda, 2006; Paarlberg, 2002; Frewer et al., 2002). On August 20, 2005, then Prime Minister Thaksin Shinawatra, who also chaired

Thailand's National Biotechnology Committee, overturned the country's ban on commercial production and trade in GMOs by endorsing the National Biotechnology Policy Framework to accomplish the goal of promoting Thailand as "the kitchen of the world" and to encourage the "emergence and development of new bio-businesses" (Thai Government, 2005 as cited by Xiang, 2007). As party to the Cartagena Protocol, Thailand drafted a National Biosafety Policy on November 7, 2007 as a way of abiding by its principles. A year later, the Ministry of Natural Resources and Environment received Cabinet approval of the draft National Biosafety Act in principle on January 22, 2008 after several public hearings (Chaturvedi & Srinivas, 2010). This draft biosafety law was reviewed by the Parliament in 2010.

Thailand has approved for biotesting the following GM crops: transgenic corn (August 1992), virus-resistant cantaloupe and squash (Sept 1992), GM tomato (March 1993), and Flavr Savr tomato (August 1993). However, procedures were carried out only for Flavr Savr tomato. From 1996 to 1997, locally developed GM crops, such as transgenic squash, papaya, rice, papaya, chili pepper, tomato, pineapple, and Bt cotton were approved for trials. In 2000, the Department of Agriculture approved small and large scale field trials for transgenic tomato, cotton, and corn; imported GM corn and GM soybean were put in the market. Large manufacturers are required by the Food and Drug Administration to label food products whose first three ingredients contain more than 5% GM (Napompeth, 2010).

In summary, the biotech policies of SE Asian countries varied over time. They also displayed characteristics that blend the attributes of each category in Paarlberg's typology. This suggests that Paarlberg's categories are better seen as points in a continuum that range from preventive to promotional.

Press freedom in Southeast Asia

The media systems of countries the world over differ in terms of the extent to which they enjoy freedom, the level to which they contribute to and partake in the country's level of economic development, their moral philosophy, and their democratic proclivity (Merrill, 2009). Southeast Asia is a diverse region that is rich in colonial history (Yin, 2009). Having been invaded by mostly European countries, dozens of languages are spoken, and various religions are practiced in the region. Forms of government range from constitutional monarchy to parliamentary democracies, quasi-democracies, communists, authoritarian governments, and governments with civilian and military leaders.

Before 1980, Southeast Asian governments have used the media primarily for nation-building. Thus, the media assumed "developmental" roles, serving as allies of political leaders by providing information and entertainment tailored to match government priorities (Massey and Chang, 2002; McDaniel, 2002; Merrill, 2009; Yin, 2009). Media content encouraged citizens to accept and follow the lead of national planning agencies. McDaniel (2002) points out that this centralized control suited the authoritarian regimes that characterized many countries in the region after gaining independence from their colonizers. However, economic reforms and technological changes in the information media after the 1980s "gradually took away the political

leaders' ability to manage public opinion the way they had been accustomed to" (p. 18).

In many parts of the region, the media are under strict government control for "national security purposes." Indeed, "government systems that were opening up to some degree are reverting to older tactics of intimidation, new press laws, imprisonment, and even violence against journalists [ostensibly] to prevent dangerous excesses and irresponsible acts that endanger social stability" (Merrill, 2009, p. 11). The unevenness in dispositions have produced few democracies in which the media are expected to stress ways by which the "people can have greater impact on governmental decision making, and how the media can share their own decision making with the public" (p. 12).

There are several ways by which the media relate to the governing power. In this arena, the four normative theories of the press proposed by Siebert et al. in 1956 are still influential. The *authoritarian* model (developed in the 16th and 17th century) characterizes the media as controlled by the government through censorship and licensing. Countries under this model have a highly concentrated and centralized power structure; a repressive system that excludes potential challengers has absolute power over the people and over the press. Myanmar, under military rule, falls under this model.

The *Soviet communist* model is the modern version of the authoritarian model, according to Becker and Vlad (2009). The main difference is that in a Soviet-communist system, the state (embodied in a small group of party leaders) generally owns all forms of mass media. The press contributes to the success of the state by

reporting positive developments under communism and by focusing on the negative aspects of opposing democratic countries. China, despite the high commercialization of its media, and Vietnam, fall under this model.

The *libertarian* model is the complete opposite of the authoritarian type because of the absence of government control and the strong belief that truth always prevails.

In the fourth model, *social responsibility*, the media are free but have obligations, such as providing meaningful information to society. This model values private ownership of the media and a free marketplace of ideas that coincide with capitalism and the free enterprise system. The Philippine media are said to abide by this model.

Despite the popularity of these normative theories, critics (e.g., Hachten, 1981; Picard, 1985; McQuail, 2005; Becker and Vlad, 2009) have pointed to their inapplicability to the developing world. To Siebert et al., a press system free from government control is central and the media's dependence on commercial support is the mechanism by which they gain such autonomy. McQuail (2005) argues that it is equally important to consider the citizens' degree of access to the media in any consideration of a country's press model.

According to Massey and Chang (2002), maintaining a close press-government relationship is a common Asian journalistic value. Journalists help preserve national harmony by being mindful of the consequences of their reports (Bayuni, 1996; Xu, 1998). Indeed, the ASEAN model of journalism calls on journalists to support their government's efforts to develop their nations and instill a

sense of national identity among citizens of different ethnic, religious, and linguistic backgrounds (Menon, 1998).

Evaluating press freedom

Several organizations assess different media systems, allowing for across-country comparisons of their findings and conclusions (Becker and Vlad, 2009). One of them is Freedom House, an independent watchdog organization established in 1941 to support democratic change, monitor freedom, and advocate for democracy and human rights. It conducts annual surveys of press freedom worldwide during which it measures a country's level of press freedom using three main categories—legal, political, and economic environment. The legal environment dimension focuses on the laws and legal institutions that restrict the operation of the media. The political environment aspect involves an examination of the government's control over the media. The economic environment dimension encompasses the structure of media ownership, media concentration, and market for advertising revenue (Becker and Vlad, 2009).

Each country is rated on the three categories, with higher numbers indicating less freedom. A country's final score is based on the total of the three categories: A score of 0 to 30 places the country in the "free" press group; 31 to 60 in the "partly free" press group; and 61 to 100 in the "not free" press group (Freedom House, 2010).

On the basis of these criteria, press freedom scores in Southeast Asian countries continue to decline. In 2009, for example, Cambodia, Malaysia, and Vietnam were ranked as "not free." Indonesia, Thailand, and the Philippines were

ranked “partly free.” The following section discusses the state of press freedom in each of the Southeast Asian countries whose coverage of GM crops will be analyzed.

Cambodia. From 1996 to 2006, Cambodia’s press freedom was consistently ranked as “not free” because of the continued restrictions experienced by journalists. However, in 2007 and 2008, Cambodia’s status changed to “partly free” due to an improvement in the country’s media environment. This change reflects the decriminalization of defamation in May 2006, as well as a reduction in the harassment of journalists (Freedom House, 2007-2008).

Rating less compared to its previous total score (60 to 61³), Cambodia’s media freedom was restricted in 2009 as the government continued to threaten and intimidate journalists by expanding the range of charges related to free expression punishable under the penal code. Although its constitution guarantees the right to free expression and a free press, multiple revisions to the 1995 press law have resulted in contradictory stipulations and restrictions, which the government has used to censor stories deemed detrimental to political stability. For instance, in October 2009, the Senate and National Assembly approved a penal code that imposes harsh penalties for defamation. While prison sentences for defamation convictions were technically eliminated in 2006, unpaid fines can lead to time behind bars. Several charges added to the new penal code, including public insult, slander, and false information, can also result in prison sentences (Freedom House, 2010).

³ A higher score indicates lesser press freedom. A score that is 0-30 means that a country is “free” (1). A score of 31-60 indicates that a country is “partly free” (2), and a score of 61-100 means that a country is “not free” (3).

This decline persists in 2010 and 2011 as the press continued to be attacked by legislation restrictions in reporting and as the government began to show indications of extending these restrictions to the Internet (Freedom House, 2011).

Malaysia. With a total score of 65 in 2009 (the same as in the previous year), the Malaysian press remains “not free” as Prime Minister Najib Abdul Razak’s government continue to employ the full arsenal of restrictions and censorship tactics used by his predecessors despite his initially positive rhetoric and actions toward the press. Article 10 of the Malaysian constitution guarantees freedom of the press, but presents a host of limitations. For instance, the Sedition Act, the Internal Security Act, and harsh criminal defamation laws are used regularly to impose restrictions on the press and other government critics. All transgressions are punishable by several years in prison—in many cases without trial. Although the media are primarily privately owned, the majority of print and broadcast outlets are owned either by political parties in the ruling coalition or by businessmen with close political connections (Freedom House, 2010).

Indonesia. In 1999, Indonesia’s press freedom status moved from “not free” to “partly free” (Freedom House, 1996-1999). Indonesia’s vibrant and independent media environment was offset in 2009 by the continued use of criminal defamation laws and the 2008 Information and Electronic Transfers (ITE) law to curtail freedom of expression in the electronic and social media. Violence against journalists declined slightly in 2009, and freedom of speech and of the press are guaranteed by the constitution and the 1999 Press Law, but media activists have expressed concern that the proposed and existing legislation threaten these rights. A state

“Secrets Bill” faced such strong resistance from civil society groups that discussions on it were suspended at the end of the year. The bill gave no concrete definition of state secrets, but specified harsh punishments for public officials and firms found to have leaked them. In general, the Indonesian public can access a variety of news sources and perspectives provided by a significant number of private media outlets. However, there is ongoing concern about the ability of large corporations and powerful individuals to control press content either indirectly through the threat of lawsuits or directly through ownership (Freedom House, 2010).

The Philippines. Hailed as the only “free” country in Southeast Asia from 1996 to 1998, the Philippines has been ranked “partly free” since 2004, and slid four points further (to a score of 48) in 2010 as a reflection of a climate of increasing impunity, problems of judicial independence in media-related cases, and increased attacks on journalists covering political events. The Philippine constitution guarantees freedom of speech and expression. There are no restrictive licensing requirements for newspapers or journalists, and there are few legal limitations, such as privacy or obscenity laws. However, national security legislation introduced in 2007 may serve to limit journalists’ traditional rights and access to sources. Defamation suits were prominent in 2009 that were harsh enough to hush criticisms of officials and public figures. Examples include former president Joseph Estrada’s libel complaint against the mainstream newspaper, the *Philippine Daily Inquirer* for a front-page story that accused his administration of coercing a Chinese-Filipino tycoon into selling his shares of the country’s largest telecommunications firm.

Another example is the frequent libel suits filed by Mike Arroyo, the former president Gloria Arroyo's husband, against various news media.

Violence against journalists increased especially at the local level, and convictions remain a distant reality as the government remains mum and paralyzed in identifying and prosecuting perpetrators. The Maguindanao massacre in November 2009 in which at least 34 journalists are known to have died, reflect this state of affairs. The Committee to Protect Journalists (CPJ) notes that the killings constitute the single deadliest event for the press since 1992, when CPJ began keeping detailed records on journalist deaths (Papa, 2009). Continued death threats, a number of assassination attempts, and the slaying of reporters especially during local elections are examples of practices that threaten the integrity of the press (Freedom House, 2010).

Thailand. Similar to the Philippines, Thailand experienced a decline in press freedom ranking (30-36) from 1999 to 2010 as a result of the ongoing political contest between the allies and enemies of Thaksin Shinawatra, a populist prime minister who was ousted in a 2006 military coup. In addition to restrictions imposed during a state of emergency in April 2009 and direct attacks on media workers covering opposition protests, a significant increase in the use of long-standing *lèse-majesté* laws exacerbate the difficulties faced by journalists. The print media remain in private hands, although large conglomerates and prominent families with political ties own the majority of outlets. Radio and television are still under the control of the state or formerly state-affiliated private businesses. Many radio stations were closed after the 2006 coup, though hundreds of officially registered stations continue to

broadcast throughout the country (Freedom House, 2010). Recently, Thailand moved from “partly free to “not free” due to the use of restrictive new legislation, such as the Computer Crimes Act that aims to punish online expression, a continued increase in the investigation and prosecution of *lèse-majesté* cases, the periodic clashes between political factions that made reporting more difficult as journalists were caught in the crossfire, and media outlets were censored (Freedom House, 2011).

Vietnam. Similar to Malaysia, Vietnam’s press freedom remains “not free” (scores ranged from 76 to 83) due to the government’s continued attack on journalists and dissidents. All news media are state-owned. Dissenters should not be given freedom to speak or publish, the People’s Army newspaper declared. The press can generally criticize government policies, but not the Communist Party’s monopoly on power. Although the constitution guarantees press freedom, the criminal code contains broad national security and anti-defamation provisions that restrict free speech. The Vietnamese media remain tightly controlled by the ruling Communist Party and the government.

As more reporters turned to the Internet to criticize the state, online censorship has increased, with bloggers being specifically targeted for harassment and detention. The ruling Communist Party of Vietnam generally views the media as a tool for the dissemination of Party and state policy. Although journalists cannot cover sensitive political and economic matters or openly question the Party’s monopoly on power without fear of reprisal, they are sometimes allowed to report on

crime and official corruption at the local level. Such reports have become increasingly common in recent years (Freedom House, 2010).

Media coverage of agricultural biotechnology and GM crops

Since the late 1990s, communication researchers have shown increased interest in how the media have covered biotechnology (e.g., Gaskell et al., 1999; Nisbet & Lewenstein, 2001). This research emphasis is not unusual given that the media have been (and will continue to be) the principal source and prime conduits of information on science topics such as genetic engineering and biotechnology for the lay public (LaFollette, 1990; Nelkin, 1995; Nelkin & Lindee, 1995; Conrad, 2001 as cited in Villela-Vila & Costa-Font, 2008).

Perhaps because of the media spotlight, biotechnology has emerged as an important science issue with global economic, political, social, and legal implications. It has been identified as a critical factor in national development and international competitiveness (Aerni, 2001; Bauer et al., 2001; Kalaitzandonakes et al., 2004; Fischhoff & Fischhoff, 2001). News coverage of biotechnology includes deliberations about its potential catastrophic consequences for mankind, other living species, and the environment (Chong et al., 2004).

Themes. The pluralist theory of the media suggests that by reflecting the balance of forces within society, the media shape public attitudes about issues through the agenda-setting process. Agenda-setting is concerned with prioritizing the news and with the kind of information being reported (Blumler, 1977; Harrop, 1987). Extending the original propositions of agenda-setting theory, second level agenda-setting suggests that mass media effects go beyond the ability to goad

audience members to assign salience to issues based on their exposure to mass media content; the mass media also tell audiences how to think about those issues (Brunkens, 2006; McCombs, 2001).

Villela-Vila and Costa-Font (2008) argue that how the press prioritizes issues and how it presents these issues may lead to an exaggeration (or amplification) of social risks in people's perceptions. Kasperson et al.'s (1988) social amplification of risk framework (SARF) states, among others, that the quality and quantity of information audiences receive can attenuate or amplify public perception of a risk situation (Kasperson et al., 1988). SARF takes into account "the public's interpretation and response to information flows from the media, one of the primary risk amplification mechanisms" (p. 185). Also emphasized in SARF is the media's role as gatekeepers of information.

Like most issues, GE and GMOs have been framed by the mass media in several ways. Entman (1993) defines framing as a process that "essentially involves selection and salience. To frame, according to him, is to "select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described" (p. 52). As such, frames function to define problems to audiences, diagnose the causes of these problems, help people make moral judgments about a problem or issue, and suggest remedies or solutions to the identified problems.

Framing is performed by journalists and reporters who construct news stories. Gitlin (1980) suggests that frames—or overarching themes—enable journalists,

when they are dealing with information, to “recognize it as information and to assign it to cognitive categories” (p. 21). Journalists then build meaningful structures with the selected information. Thus, frames are “active, information-generating, as well as information-screening devices” (p. 21). Gitlin (1980) explains that media frames represent how journalists come to identify and classify information “to package it for efficient relay to their audiences” (p. 7).

Sources of information. How journalists come to frame a story is often assisted by the sources they cite in their news reports. Because journalists refer to these sources for facts, ideas, interpretations and evaluations, these news sources have a great tendency to shape how the news is framed. Furthermore, the selection of sources can reflect institutional biases or particular inclination towards or against an issue through the range of viewpoints cited in the stories (Herman, 1988 & Bennet, 1990 as cited in Xiang, 2007). Lester (2010) posits that because of professional ideologies, journalists tend to “ground stories in ‘objective’ and ‘authoritative’ statements from ‘accredited’ sources and thus provide structured preference ‘to the opinions of the powerful’” (p.90). Hall et al. (1978) refer to these sources as the ‘primary definers’ of topics whose interpretations become the basis for other arguments to be labelled irrelevant.

Studies on GM reporting by the print media show the constant presence of politicians, advocacy groups, and scientists as news sources (Szu, 2010; Mula, 2006; Xiang, 2007). Mula (2006) observes this in the coverage of GM rice by the Philippine mainstream newspapers and Xiang (2007) in the Chinese and Thai newspapers’ reporting of GM rice and GM papaya.

Lester (2010) argues that there is a competition for access to and space in the media between elite or non-elite political contenders and the ordinary or the affected. As such, Gans (1979) argues for more investigations on sources as holders of power and as representatives of organized and unorganized groups to understand the news fully.

Tone of coverage. According to Brunkens (2006), “the tone the media use to disseminate news tells the audience not just the news, but also the opinion of a particular reporter” (p. 20), suggesting that tone or valence “is one more part of media framing and agenda setting that influences audience members to think a certain way about a particular issue” (Brunkens, 2006, p. 4).

Finding that the Thai news media demonstrated the most negative attitude toward GM crops due to the intense lobbying of advocacy groups, Xiang (2007) concludes that tone is associated with dominant sources. Villela-Villa and Costa-Font (2008) observe an association between negatively biased news about GM food and the lack of public trust in regulatory bodies. They suggest that ambiguity in lay people’s risk perception is enhanced by conflicting media reports. This is so, Siegrist and Cvetkovich (2001) posit, because positive and negative information have different effects on the acceptance of the message. According to them, “people have more confidence in studies with negative outcomes than in studies showing no risks” (p. 205). In general, individuals show a preference for known risks than uncertain ones (Viscusi, 1998), and recall highly dramatic news stories better than “low-key” stories due to the former’s emotional appeal (Wahlberg and Sjoberg, 2000). Hornig-Priest (1988) argues that news stories with a social political slant can lead to higher

perceived risk than stories with a scientific slant because of safety and precautionary information that give more assurance to people.

News frames and news sources are but components of the larger journalistic milieu in which journalists operate. Several studies (e.g., Frewer et al., 2002; Kitzinger & Reilly, 1997; Reynolds & Seeger, 2002; Shih, Wijaya & Brossard, 2008; Wahlberg & Sjoberg, 2000) have examined the effects of individual characteristics of journalists and reporters as well as organizational constraints on media performance, but few have analyzed the influence of a country's degree of press freedom on its ability to communicate controversial science and risk issues to the public. Also, as Kasperson et al. (2003) bemoan, the existing empirical studies on risk using SARF mainly reflect the experience of the North. After more than 15 years, there is a need to test SARF's propositions (and most theoretical frameworks produced from the West) in different cultural and political contexts, including that of agricultural Asia. The authors warn that the task is formidable, but such studies may be more plausible by starting from the standpoint of the key mediators of risk communication, the mass media. This is critical because SARF aims to describe and organize the amplification effects of the media as the intermediary between the government and society. As Chong et al. (2004) suggest, the vast majority of studies on the media's coverage of biotechnology are based in the U.S. or Europe. Few have examined the Asian context. Given the diversity of the Southeast Asian region, "an international comparison will be instructive because journalistic values and practices are likely to differ from one country to another as they are shaped and

constrained by the political, social, and cultural milieus in which news reporting is situated” (p. 6).

In this study, media performance in covering GM crops or GM technology is seen as having three dimensions: (1) coverage intensity, (2) frame richness, (3) valence of the stories toward GM crops, and (4) number of sources cited.

Considering the foregoing literature, this study asks:

RQ1: How *intensely* were GM technology and GM crops covered in the SE Asian countries of Cambodia, Malaysia, Vietnam, Indonesia, Thailand and the Philippines that display different biotechnology policies and levels of press freedom?

RQ2: Which of these countries produced the most number of *frames* in their newspapers’ coverage of GM technology and GM crops? What were the dominant themes or frames in the coverage of each country?

RQ3: What *tone* did the newspapers use in their coverage of GM technology and GM crops? What is the distribution of valence or tone across countries?

RQ4: Who were the *sources* frequently cited in the articles? Which of these countries cited the most number of sources?

RQ5: What is the influence of national biotech policy and degree of freedom on intensity of coverage, frames use, the valence of articles, and the number of sources cited?

Figure 1 offers a diagram of the study’s conceptual framework.

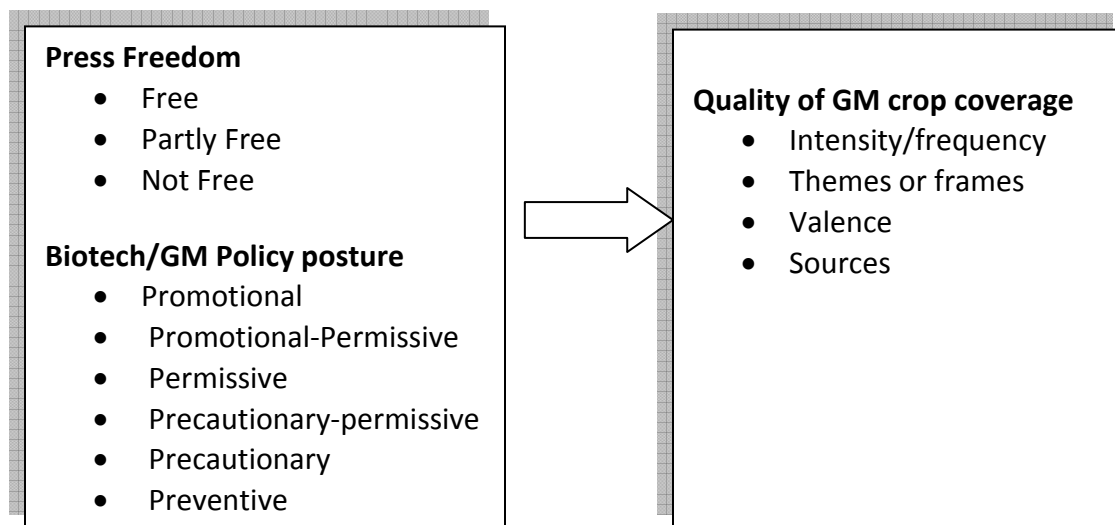


Figure 1. The study's conceptual framework

CHAPTER 3. METHOD

This study examined the characteristics of the news coverage of GM crops in the six Southeast Asian countries of Cambodia, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. Different in terms of the level of press freedom they enjoy, these countries were chosen because of the significant contribution of agriculture to GDP, employment, livelihood and food security. The measurements of this study's independent variables (degree of press freedom and biotechnology policy or stance) were secured from secondary data sources—the Freedom House for status of press freedom, and national official documents and pronouncements for the country's respective biotechnology policies. To assess media performance, a content analysis of news reports about GM crops in the six SE Asian countries was conducted.

Secondary data

According to Scheufele (1999), media frames are shaped by several factors (e.g., journalistic routines, pressure from interest groups, and organizational norms). Aside from these identified factors, this study posits that a country's degree of press freedom and national policy with respect to biotechnology (e.g., whether promotional, permissive, precautionary, or preventive) have a bearing on the quality of news coverage about GM crops.

A country's policy posture toward biotechnology was determined by examining government statements and official documents regarding a nation's official position on biotechnology from 1996 to 2011. The yearly policy dispositions were determined from policy pronouncements by heads of state, national leadership

declarations, official policy statements from the departments or ministries of agriculture, and legislative documents and other documents from specialized policy-making bodies.

The annual reports of Freedom House were examined to determine the state of press freedom in the six SE Asian countries. These reports consider the legal, political and environment situations in a specific country to rank the current state of news reporting in each nation. As Xiang (2007) points out, “the rankings are highly correlated with several other ratings of democracy also frequently used by researchers” (p. 22).

Content analysis

Content analysis is a “research technique for the objective, systematic and quantitative description of the manifest content of communication” (Berelson, 1952, p. 18). In this case, quantitative content analysis aims to sort messages into categories, describe the messages’ characteristics in terms of what topics are prominent, and compare the frequency of these categories/topics (Merrigan and Huston, 2009). It is also a useful tool with which to determine biases and themes in news coverage (Rubin and Piele, 1986).

Given the objectives of the study, content analysis was an appropriate method to describe mass media content from which one can infer media performance in covering specific topics or issues.

The sample

This study analyzed GM news reports from the region's elite newspapers over the past 15 years, a period that covers the introduction and eventual commercialization of some GM crops in Southeast Asia. Straight news articles, feature stories, editorials and commentaries, and reader's responses were analyzed. Stories written by foreign correspondents and obtained through wire feeds were not considered. Hence, a census or a complete enumeration of articles collected using the criteria mentioned were analyzed in the study.

Six newspapers from six Southeast Asian countries were examined. They are the *Phnom Penh Post* (Cambodia), the *Jakarta Post* (Indonesia), *The Star* (Malaysia), *Thanh Nien* (Vietnam), the *Bangkok Post* (Thailand), and the *Philippine Daily Inquirer* (Philippines). These newspapers were selected because they are reportedly the leading mainstream newspaper in their respective countries, they have a wide circulation and have been known to demonstrate strong inter-media agenda-setting effects. All six papers are published in English, and all demonstrate a strong web presence. These newspapers were initially identified from the ABYZ News Links (URL: <http://www.abyznewslinks.com/>), which describes itself as "a major gateway to international newspapers."

The *Phnom Penh Post*, first published in July 1992 by Michael Hayes, is the oldest existing independent newspaper in any language in Cambodia with a national and international circulation (*Phnom Penh Post*, n.d.). Published bi-weekly, it has a circulation of 3,000-5,000 with subscribers in 48 countries around the world (TKG,

n.d.). It is considered the newspaper of record on Cambodian current events, and is read by decision makers and opinion leaders.

The *Jakarta Post* is the largest daily English language newspaper in Indonesia. It has an average circulation of 50,000 copies per day, and caters to local English-speaking expatriates and the diplomatic community. Launched in April 1983, the paper is owned by PT Bina Media Tenggara, an independent, private newspaper chain (founded in late 1982) that releases four leading national publications: *Suara Karya*, *Kompas*, *Sinar Harapan*, and *Tempo*. In many ways, the *Jakarta Post* acts as the unofficial voice of the Indonesian government to the international community.

In 1994, the *Post* became the first Indonesian newspaper to go global under a project nicknamed “Go International.” Under this system, the paper is made accessible in digital format (via modem to three main computers in New York and California in the United States and London in the United Kingdom) 24 hours a day to tens of thousands of subscribers around the world (*Jakarta Post*, n.d.).

The Star, another daily, is the most widely read English newspaper in Malaysia with a recorded circulation of 286,409 from July 1, 2009 to June 30, 2010 (ABC, 2010). First published in September 1971 as a regional newspaper based in Georgetown, Penang, the *Star* went national in January 1976 when it set up an office in Kuala Lumpur. Today, it is located at Selangor. Hailed as the first tabloid and the first English-language daily to be printed using the web-offset process, the *Star* is published in four editions—two cover the northern peninsular states of Penang, Kedah, Perlis and northern Perak, while the other two editions cover the rest of the country. It is packaged as a 3-in-1 paper because it is composed of the

main paper, which covers the latest in both local and international news; *StarBiz*, which offers comprehensive coverage of business developments, market trends, financial reports and updates in the stock markets; and *StarTwo*, which features articles about lifestyle, entertainment, health, parenting, social etiquette, science, the environment, fashion, and food. These sections are also available in the newspaper's website, the *Star Online* (*The Star*, n.d.).

Thanh Nien, launched in January 1986, is the flagship publication of the Vietnam National Youth Federation. It is a widely circulated daily newspaper with a readership of over two million per week (*Thanh Nien*, n.d.). *Thanh Nien* also offers online news editions in Vietnamese and in English. It has received numerous awards for outstanding journalism and its "dedication to society," among which are the Second and Third Grade Labor Medals awarded by the President in 1996 and 2002, and a Certificate of Merit from the Ministry of Justice in 2000 for helping to publicize the legal system and popularize basic knowledge of the law among citizens (*Thanh Nien*, n.d.).

The *Bangkok Post* is the most widely circulated English-language daily newspaper in Thailand owned by the Post Publishing Public Co. Ltd. The newspaper was founded in August 1946 by former Office of Strategic Services officer and editor Alexander MacDonald and his Thai associate, Prasit Lulitanond (*Bangkok Post*, n.d.). The *Bangkok Post* online is Thailand's top site for regional news, educational materials, and general interest books.

The *Philippine Daily Inquirer* is the leading daily newspaper in the Philippines. Established in 1985, the *Inquirer* boasts of more than 2.7 million readers and is

considered one of the most influential publications in the country. Its online edition, Inquirer.net, provides the most comprehensive and up-to-the-minute coverage of local and international news (*Philippine Daily Inquirer*, n.d.).

The complete story—including the headline, the lead paragraph, and the entire text—was the unit of analysis for this study.

Variables and their measurement

In this study, quality of news coverage were ascertained by determining intensity of coverage, story themes or frames, number of sources cited, and the valence of the story toward biotechnology.

Intensity of coverage refers to issue prominence measured in terms of (1) the number of stories about GM crops published and (2) the length of these stories. Length of story is the number of words that constitute the complete news story.

A *theme* or frame refers to the overarching story line or the focus of the story. According to Chong et al. (2009) in their study of agricultural biotechnology news coverage, an article may demonstrate the following themes: (1) safety issues related to human, animal and environmental health benefits; (2) food security issues, including the extent to which GM crops are seen as being able to address the problems of hunger, malnutrition, disease, poverty, social stability, sustainability or self-sufficiency; (3) the economic dimension of GM crops, including existing and potential markets, impact on the stock market, industrial and agricultural growth, reaction of investors, and implications for the domestic economy; (4) legal issues related to GM technology, including government policies, ownership of intellectual property (especially patenting), biosafety protocols and government regulation of

development and distribution; (5) controversy, dispute or debate, including the moral and ethical implications of genetic engineering, the advantages and disadvantages of GM crops vis-à-vis non-GM agricultural products; (6) public protests against GMOs and genetic engineering, including public demonstrations against field trials or the commercialization of genetically modified organisms, demonstrators on the streets and other public spaces, and anti-GE campaigns; (7) the extent to which GMOs are present in a given country, including the import and export of GM crops and the availability of GM crops in the market; (8) research and development efforts, including basic and applied research, field testing, biosafety trials, and commercialization; (9) the potential of giant multinational agricultural corporations that hold the patent to GM seeds to monopolize global agriculture; and (10) other themes that cannot be categorized under any of the nine items above.

Because a story may exhibit multiple themes or frames, all frames within a story detected were coded.

Valence refers to the overall tone or orientation of the news story toward genetic engineering or toward GM crops. It has three categories: negative (0), neutral (1), or positive (3). A story is coded as having a *negative* valence when it suggests uncertainty, danger, threat and disadvantages of genetic engineering and GM crops. An article displays a *positive* valence when it reports the promise of national prosperity, economic growth, health promotion and general well-being associated with the deployment of genetic engineering as part of a country's development agenda. When positive and negative arguments are present, the article

was characterized as having a *neutral* valence. Articles that are difficult to categorize as positive or negative were also coded as neutral.

Information sources refer to persons, organizations, groups, government entities, and the like, who were cited in the news reports as originators of information, data, interpretation, opinions, or analysis. Because the sources play an important role in how the story is framed or the themes present in a story, the source attributions indicate the extent to which the newspapers favored the voices or points of view of various stakeholders.

Following the categories used by Xiang (2007), Abbott and Lucht (2001), and Chong et al. (2009) in their comparison of GM newspaper coverage among newspapers, sources are classified into: (1) scientists, professors or researchers from government or non-government universities and research centers or institutions (e.g., a senior researcher at the Bogor Institute of Agriculture); (2) scientific journals and publications, including their editors; (3) representatives of multinational corporations that produce GM seeds, such as Monsanto, Pioneer Hi-bred and Syngenta and their subsidiaries; (4) members of the food industry and their associates (e.g., Vietnam Food Association); (5) ordinary citizens and consumers, but not farmers; (6) international advocacy groups (e.g., Greenpeace, Friends of the Earth, Union of Concerned Scientists); (7) local or regional NGOs, excluding Greenpeace and the like (e.g., Cambodia's Biodiversity Enabling Activity, Indonesian Consumers Organization); (8) International development groups (e.g., the United Nations and its affiliate agencies) and international financial institutions (e.g., World Bank, Asian Development Bank); (9) politicians and government employees except

government scientists; (10) farmers and farmers associations; (11) local and international news outlets and news agencies (e.g., Vietnam News Agency, *Saigon Times Daily*) and wire agencies (e.g., Reuters, Agence France Press or AFP, the Associated Press or AP); (12) international government institutions like the United States Department of Agriculture (USDA) and international scientists or researchers; (13) others, including religious leaders, lawyers and unnamed and/or unidentified sources. All sources cited in the story were coded.

Degree of press freedom refers to the Freedom House annual ranking each of the six SE Asian countries have received over the past 15 years. This was measured using Freedom House scores for each country for the period 1996-2011 (Appendix A). A score that is 0-30 means that a country is “free” (1). A score of 31-60 indicates that a country is “partly free” (2), and a score of 61-100 means that a country is “not free” (3).

Biotech policy refers to the policy stance each country has regarding biotech or GM crops. Because each country's attitude or policy statements about biotech tend to vary over time, each country's policy stance was evaluated on an annual basis, from 1996 to 2011. An analysis of policy pronouncements over time indicate that each of the six countries' political stance on GM fall in between Paarlberg's (2001) categories of promotional, permissive, precautionary and preventive. In other words, each nation's policy statements contained overlapping characteristics of Paarlberg's categories. This is why the current study proposes six categories in a modified classification system. Adapting Paarlberg's (2001) framework for developing nations, a country's biotech policy in this study was categorized as: (1)

promotional or one that accelerates the spread of GM crop and food technologies within the borders of a nation by fully allowing the commercialization of GM crops; (2) a combination of promotional and permissive or one that allows research and field trials on GM crops (but not commercialization), and considers the importance of labeling GM products; (3) permissive or neutral toward the new technology in which labelling of GM products is not mandatory; (4) a combination of permissive and precautionary or one that has no intention of slowing down biotechnology but has still to adopt labeling regulations; (5) precautionary or intended to slow the spread of GM crops and foods for various reasons but without banning the technology altogether; and (6) preventive or one that blocks or bans the testing and planting of GM crops within national boundaries.

Data analysis

The intensity of GM coverage in the six SE Asian countries (RQ1), the dominant themes in the coverage of each country (RQ2), the valence or tone of the coverage (RQ3), and the sources cited in the stories (RQ4) were determined using frequency distribution data.

To find out if the countries differ in terms of coverage intensity, an analysis of variance test was conducted. The differences among the six countries in terms of story themes and tone of coverage were ascertained using chi-square tests.

Does a country's degree of press freedom have a bearing on coverage performance? To determine whether degree of press freedom influences coverage intensity, number of sources, and number of frames used, a multivariate analysis of

covariance (MANCOVA) with year as a covariate was performed. To determine the association between press freedom and tone, a chi-square test was conducted.

The same statistical procedures were applied to determine the impact of national biotech policy on coverage intensity, frames, tone, and sources cited in the news coverage.

Intercoder reliability

Intercoder reliability refers to the extent to which independent coders evaluate a characteristic of a message or artifact and reach the same conclusion (Lombard, 2010). Two journalism graduate students were trained on the coding protocols using 10% of the articles in the entire sample of 622 articles. The intercoder reliability for each of the variables of interest was computed using Scott's pi, which accounts for chance agreement and is appropriate when the study makes use of two coders who are dealing with nominal variables (Lombard, 2010). The formula is $Pi = PAo - PAE / 1 - PAE$, where PAo stands for the proportion of observed agreement, and PAE stands for the proportion of agreement expected by chance (Neuendorf, 2002).

Table 2 lists the intercoder reliability results.

Table 2. Intercoder reliability results

Variable	Intercoder reliability (Scott's pi)
Length of stories	1.00
Frames	0.82
Sources cited in the articles	0.80
Tone of articles	0.85

CHAPTER 4. RESULTS AND DISCUSSION

A total of 622 articles were retrieved from the six newspapers' online archives and digital libraries. Of these, 469 were straight news reports, 76 were feature stories, 72 were editorial or opinion pieces, and five were reader's comments or letters to the editor. Of the 622 articles, 571 were written by in-house reporters, 47 were from contributors, and four were sent by readers.

Intensity of Coverage

Coverage of GM crops in the six countries from 1999 to 2011 can be described as medium to low in intensity. Only Thailand and the Philippines reported heavily on the topic. Thailand's *Bangkok Post* published 323 stories with an average length of 525 words, while the *Philippine Daily Inquirer* published 200 stories with an average length of 506 words (Figures 2 and 3).

GM crops did not figure prominently in Cambodia's *Phnom Penh Post*, Indonesia's *Jakarta Post*, Malaysia's *the Star*, and Vietnam's *Than Nien*. Cambodia demonstrated the least attention to GM crops, publishing only six articles with the shortest average length (425 words). Malaysia had 17 stories, but had the longest stories that averaged 987 words. Indonesia discussed GM crops somewhat lightly with 56 articles averaging 657 words, while Vietnam had 20 articles that were, on average, 559 words in length (Figures 2 and 3).

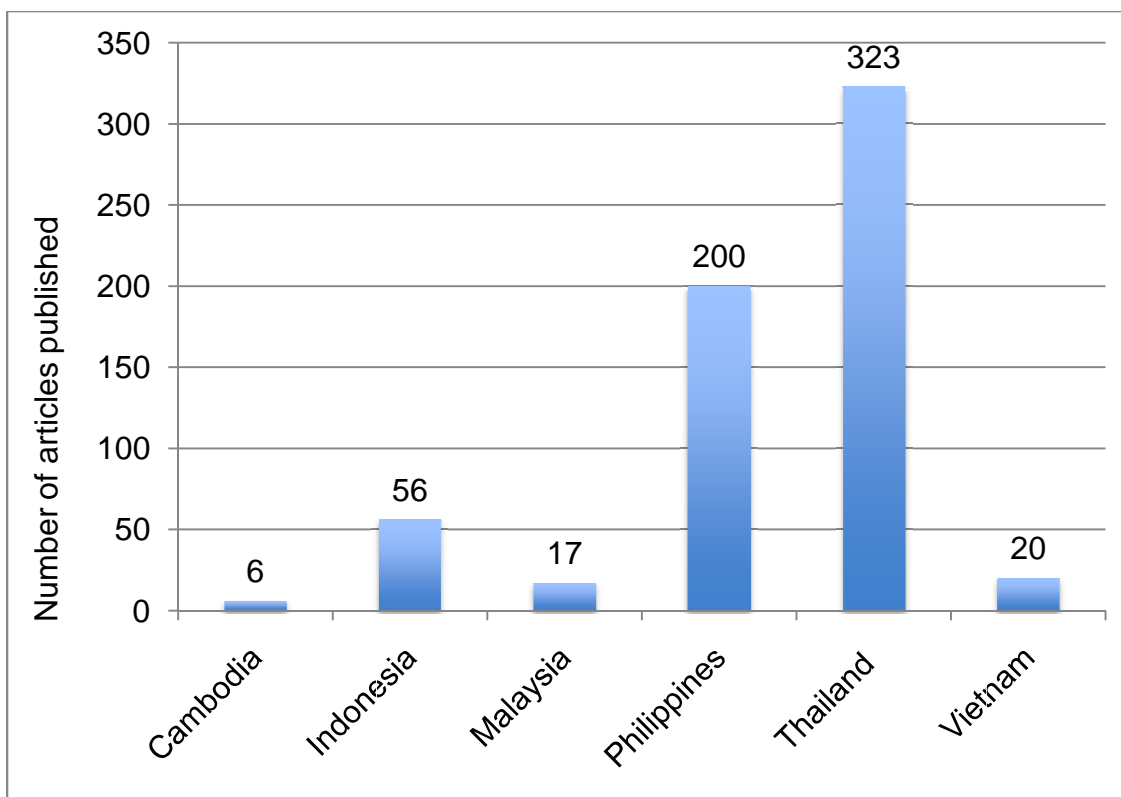


Figure 2. Number of articles published per country

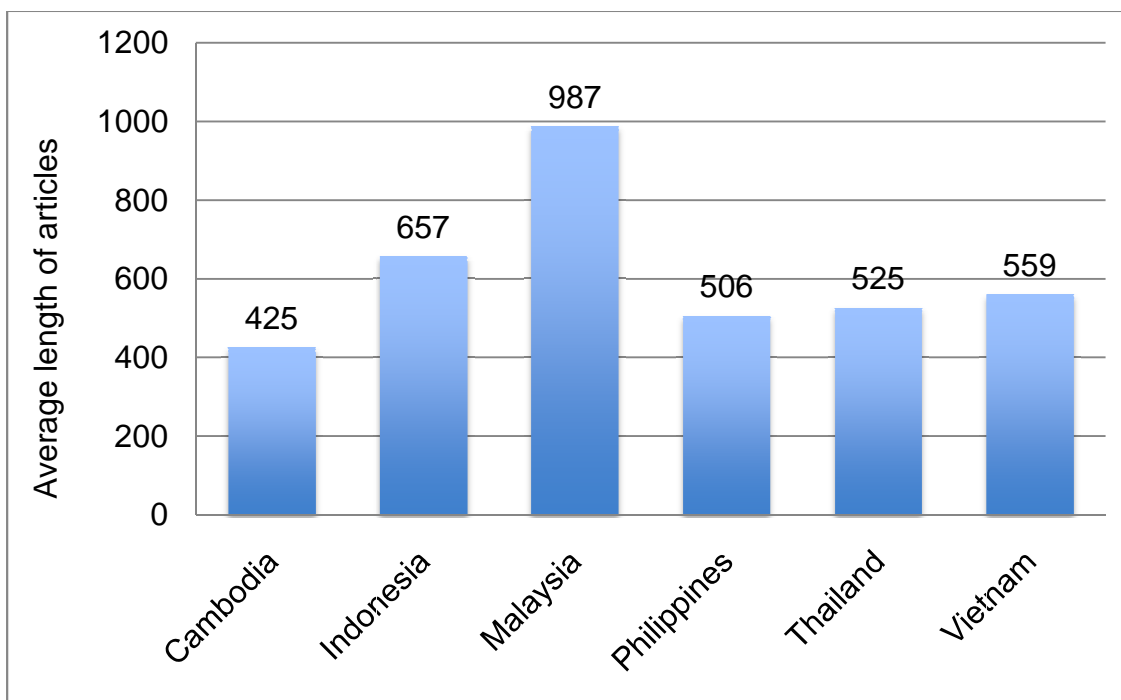


Figure 3. Average length of articles per country

Themes or Frames

This study aimed to determine which of the six countries produced the most number of frames in their newspapers' coverage of GM crops and what themes or frames dominated the coverage of each.

As Figure 4 shows, average frame use per story was slightly higher for Indonesia (4.11) compared to Thailand (4), Cambodia (4), the Philippines (3.95), Vietnam (3.95), and Malaysia (3.59). This indicates that Indonesia discussed GM crops more broadly by using more perspectives and storylines than the other five countries, although these differences were not statistically significant. Notably, most of the articles in the *Jakarta Post* (16) included five to seven themes, while Malaysia contained only four or five themes per story.

Table 3. Average number of themes or frames used per story per country

Countries	Average number of themes or frames used
Indonesia	4.11
Cambodia	4.00
Thailand	4.00
Philippines	3.95
Vietnam	3.95
Malaysia	3.59

A within-country analysis shows that safety issues (found 267 times) and policy/legal issues (265) were the dominant themes of stories published in Thailand. These dominant themes communicate considerable worry over possible health risks and concern over gene contamination from GM test trials resulting from the country's lax biosafety regulations. In 1999 and 2004, GM cotton and papaya seeds were reportedly "leaked" to the public, galvanizing advocacy groups to stage protests and

prompting Agriculture Minister Thira Sutabutra to recommend the revoking of a 2001 cabinet resolution that bans open-field trials.

Similarly, safety and policy were the top two issues in the Philippine coverage. Ever since the commercialization of Bt corn in 2002, stories that discussed GM crops' impact on human health and the environment continued to be a significant part of the *Philippine Daily Inquirer's* agenda. Questions about the government's policy-making process related to GM research and development were also prominent in the articles.

Indonesia's *Jakarta Post* also had a substantial number of stories that focused on policy and legal issues (44). The Indonesian government's approval of limited field trials of Bt cotton in 2001 encouraged environmental groups to clamor for labeling laws and a more stringent regulation of imported seeds and products. The decree permits the limited release of the transgenic cotton Bt DP 5690B as a quality crop genus under the name of NuCOTN 35B or Bolgard in seven regencies in South Sulawesi. As of 2011, more discussions about the Environment Law, which requires all GM products to undergo an environmental impact analysis [Amdal] permeated the Indonesian newspaper. Allegations of gene contamination can be found repeatedly in the *Jakarta Post*, perhaps the reason why safety issues (36) was one of the two next dominant themes in that newspaper. Another recurring theme for Indonesia was food security (36). Stories that exhibited this frame generally extol the value of GM crops and the national leaders' belief that biotechnology can help move the country to self-sufficiency in food production, improve farmers' income, and give the agriculture sector a competitive edge.

Safety issues (14) and food security (10) were also dominant in the stories published in Malaysia's *Star*. Although Malaysia is yet to commercialize a GM variety, several crops that contain traits of value are now undergoing field tests. At the Malaysian Agricultural Research and Development Institute, rice has been successfully modified to resist the tungro virus, and transgenic papayas with a longer shelf life and able to resist ring-spot virus have been introduced. GM crops are relatively new to Malaysian consumers, which may explain the growing public concern about perceived hazards. To address this, the National Biotechnology Directorate was reported to be stepping up its efforts to implement public awareness programs

Policy and legal issues (5), food security (5), and safety issues (4) were the dominant themes in Cambodia's *Phnom Pehn Post*. One of the signatories of the Cartagena Protocol, Cambodia was still working on a national strategy in 2001. With weak regulatory enforcement, however, local NGOs were worried about the transboundary movement of GM in the country, its impact on biodiversity, and its effects on human health.

Unlike its five counterparts, research and development dominated the coverage of Vietnam's *Than Nien*. Several stories featured the government's plans to cultivate GM crops in 2015 and its hopes for more GM contribution to the national harvests (planned at about 70%) by 2020. Another theme frequently employed was policy/legal issues as discussions about the regulation of imports and other guidelines became a popular subject of news reports. The next frequently used frame for Vietnam was the economic theme, exhibited by articles that played up the

country's hopes of reducing the nation's dependence on imports through increased GM production. Vietnam's government sees GM technology as a means of helping to narrow the trade deficit and calm concerns about economic instability.

Table 4 shows the frequency distribution of themes portrayed per country.

A chi-square test was conducted to determine whether the six countries differed in their use of frames. As Table 5 indicates, the six newspapers significantly differed in their use of the following themes: safety issues [$X^2(10)=85.33$, $p<0.00$], food security [$X^2(10)=58.43$, $p<0.00$], economic issues [$X^2(5)=30.33$, $p<0.00$], policy/legal issues [$X^2(10)=31.321$, $p<0.00$], public protest and anti-GM campaigns [$X^2(10)=41.49$, $p<0.00$], presence and importation of GM crops [$X^2(5)=12.45$, $p<0.03$], and other frames [$X^2(10)=20.28$, $p<0.03$].

Specifically, Thailand was more likely to include safety (267), food security (117), economic issues (178), policy/legal themes (265), presence and importation of GM (103), and other frames (97) compared to the other five newspapers. "Other" frames include consumers' rights to be informed, and the importance of public participation in decision-making. The Philippine newspaper was more likely to report public demonstrations and anti-GM protests (70) than the other newspapers.

Tone

Newspaper coverage in the six countries exhibited a neutral to negative orientation toward GM crops. A total of 304 articles showed a negative slant and 256 stories displayed a neutral tone; only 62 articles portrayed GM positively (Figure 11).

Thailand, Vietnam, Malaysia, and Indonesia adopted a neutral stance in their reports, reflecting the journalistic tenet of balanced reporting and fair coverage as

Table 4. Distribution of use of themes per country

	Cambodia		Indonesia		Malaysia		Philippines		Thailand		Vietnam	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Safety issues	4	67	36	64	14	82	158	79	267	83	13	65
Food security	5	83	36	64	10	59	93	47	117	36	11	55
Economic issues	2	33	20	36	9	53	64	32	178	55	11	55
Policy/legal issues	5	83	44	79	8	47	131	66	265	82	12	60
Controversy/ dispute	1	17	10	18	1	6	32	16	27	8	3	15
Public protests/anti-GM campaigns	1	17	4	7	0	41	70	35	54	17	1	5
Presence of GMOs in the country	3	50	20	36	0	12	50	25	103	32	5	25
Research and development	2	33	25	45	7	59	83	42	142	44	15	75
Monopoly of multinational companies	0	17	7	13	2	82	25	13	36	11	5	25
Other	1	67	28	50	10	59	76	38	97	30	3	15

exemplified by the presence of various opinions and points of view. The negative GM portrayals in Thailand echo Xiang's (2007) finding that the Thai newspapers' coverage of stories specific to GM papaya from 2001 to 2007 were decidedly slanted against GM.

Cambodia and the Philippines exhibited the most negative orientation toward GM crops. The decision of the Cambodian government to promote organic farming over GM may explain this unsupportive coverage. On the other hand, highly charged events like the uprooting of GM crops in experimental fields, the banning of GM plantings at the provincial level, outspoken anti-GM environmental groups, and the conflicting assessments of university scientists and religious leaders may be behind the negative orientation of the Philippine coverage.

The continuing debate over GM's alleged adverse effects on humans and on the environment fostered the dismal tone of the stories. Navarro et al. (2011) reported similar findings, observing that negative articles in the *Philippine Daily Inquirer* tended to focus on health issues that were more imagined than real, such as the risks of contracting cancer and other diseases, even hinting at the possibility of mental retardation, baldness, and homosexuality as potential consequences of consuming GM foods. As the country's flagship newspaper, the *Inquirer*, boasts of its independence from external and internal pressures, which often translates to views that oppose those of the administration.

Table 5. Chi-square tests comparing the six SE Asian countries in terms of frame use

	Country						Total	Chi-square	df	Asymp. sig. (2-sided)
	Cambodia	Indonesia	Malaysia	Philippines	Thailand	Vietnam				
Safety	4	36	10	158	267	13	488	85.333	10	0.000
Food security	5	36	8	93	117	11	270	58.429	10	0.000
Economic issues	2	20	9	64	178	11	284	30.329	5	0.000
Policy/legal Controversy	5	44	8	129	265	12	463	31.321	10	0.001
Public protest and anti-GM campaigns	1	10	1	32	27	3	74	9.868	5	0.079
Presence and importation of GM	1	4	0	70	54	1	130	41.494	5	0.000
Research and development	3	20	0	50	103	5	181	12.445	5	0.029
Monopoly of multinational companies	2	25	7	83	142	15	274	8.646	5	0.124
Other (e.g., public knowledge and attitudes)	0	8	2	25	36	5	76	4.469	5	0.484
	1	28	10	74	97	3	213	20.283	10	0.027

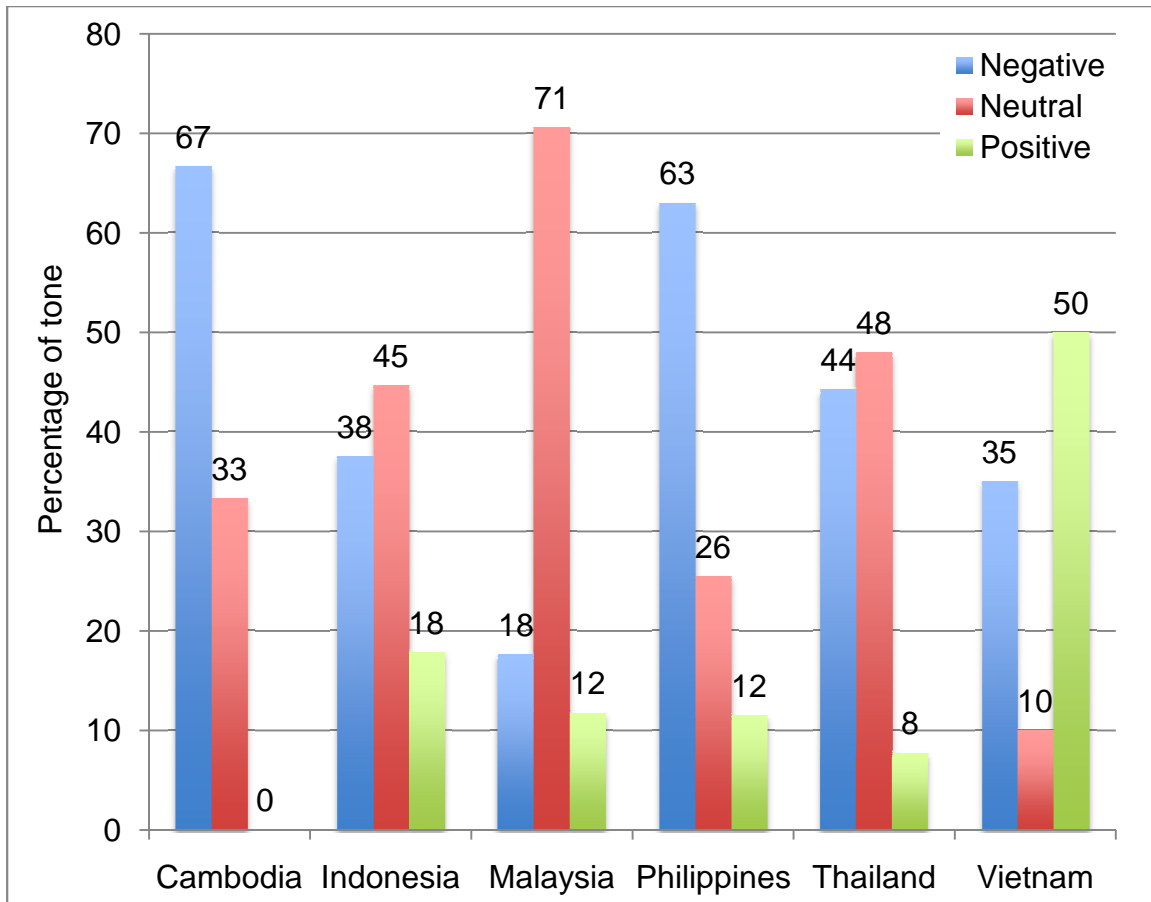


Figure 4. Tone of articles per country

To determine if there is a significant difference among the six newspapers in terms of the orientation of their GM coverage, a chi-square test was conducted. Considering the low number of articles in some countries, the cross-tabulation was likely to produce cells with expected values less than 5. To comply with the requirements of the test, the newspapers from Cambodia, Malaysia and Vietnam, countries whose press systems were classified as not free, were collapsed into a single category. The results show a significant difference among the four groups in terms of the orientation of their GM coverage [$\chi^2 (6) = 37.737, p < .00$]. As indicated in

Table 6, there were more neutral to negative articles in the Thai newspaper than in the newspapers of other countries.

Table 6. Chi-square test comparing the difference among the six SE Asian countries in terms of the tone of the newspapers' GM coverage

	Tone			Total	Chi-Square	df	Asymp. Sig. (2-sided)
	negative	neutral	positive				
Cambodia, Malaysia & Vietnam	14	25	4	43	37.737	6	.000
Indonesia	21	25	10	56			
Philippines	126	51	23	200			
Thailand	143	155	25	323			
Total	304	256	62	622			

Sources cited

The presence of multiple sources is a journalistic standard that demonstrates ability to gain access to different sources for data, opinions, and interpretations. Because the sources that supply journalists with information have a strong tendency to influence story frames, this study also sought to identify the sources frequently cited in the articles and the newspapers' performance in this regard by determining the number of sources found in each article.

As shown in Figure 12, the most frequently cited sources in the six newspapers were politicians and government employees or institutions (356), international advocacy groups (178), local or regional non-governmental

organizations or NGOs (178), and others, such as religious leaders, lawyers and unnamed experts (166).

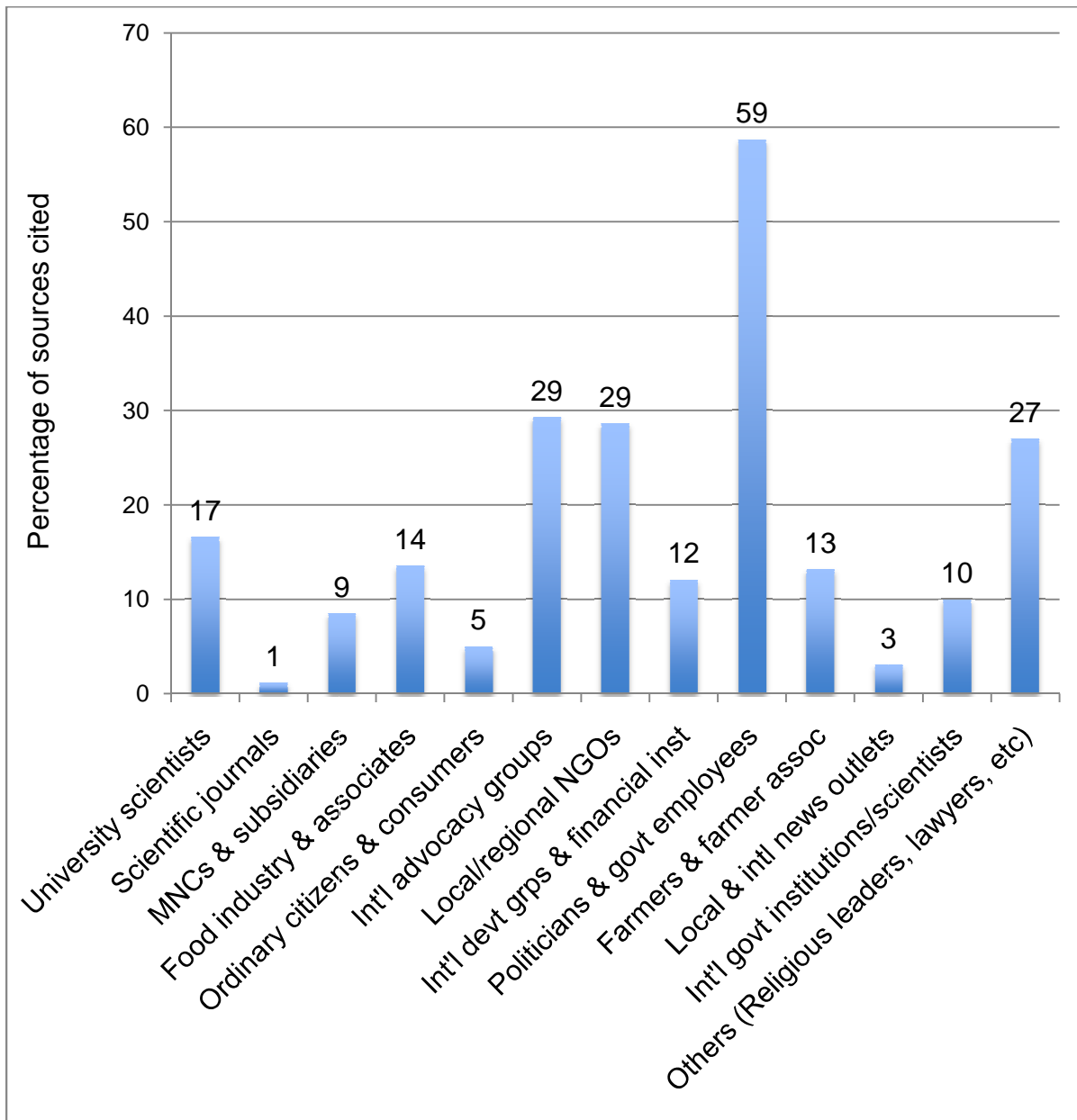


Figure 5. Sources cited in the six newspapers combined

Figure 6 displays the breakdown of these sources per country. As Figure 6 shows, politicians and government employees were the top sources in all six

countries. Hall et al. (1978) refer to these dominant sources as the “primary definers” of topics whose interpretations become the basis for arguments or opinions to be labeled as important or irrelevant. In Thailand, international advocacy groups such as Greenpeace and Friends of the Earth were the next frequently cited, followed by local or regional NGOs such as BioThai and the Association for Community and Ecology Development. In the Philippines, the opinions of local NGOs, such as the Network Opposed to Genetically Modified Organizations (No2GMOs) and Philippine Greens, as well as religious leaders, were the next most frequently mentioned sources. This further explains the negative tone of the coverage in the Philippines where environmental groups and the religious sector are known for their vocal opposition (Mula, 2006).

The same voices were dominant in Indonesia where strong opposition to GM technology is lobbied by local NGOs, such as Konphalindo and the Indonesian Consumers Foundation, as well as lawyers. In Malaysia and Vietnam, the opinions of lawyers and unnamed sources were the second most frequently cited. In Cambodia, international advocacy groups and local NGOs mostly in favor of traditional crops and farming practices were the most frequently cited sources, along with politicians and government employees. Their perspectives imbue the coverage with a strong negative slant.

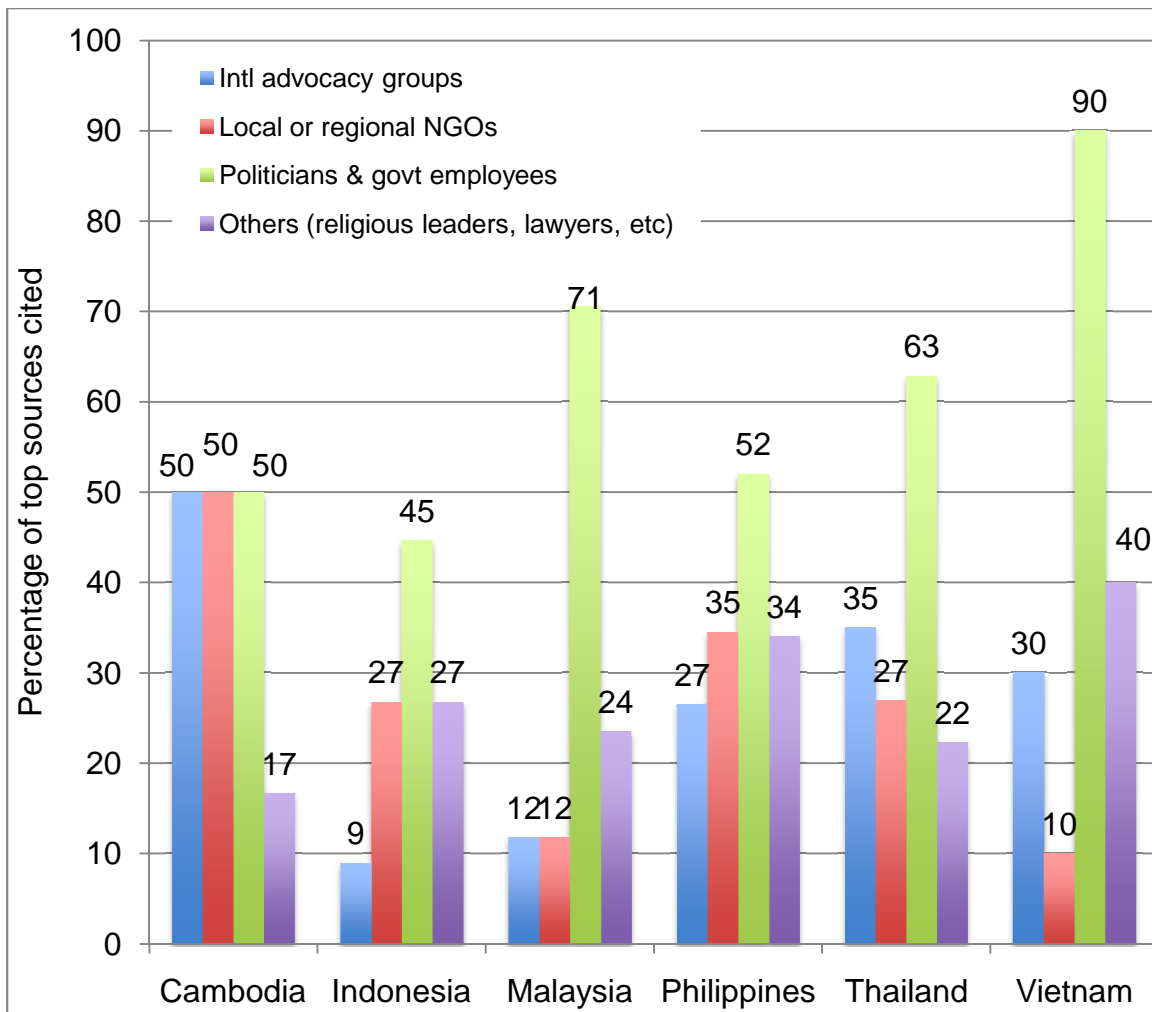


Figure 6. Top sources cited in the articles per country

Among the six countries, Vietnam cited the most number of sources (2.85) (Figure 7), suggesting a vigorous attempt to balance different points of view regarding a controversial technology and an attempt to make up for few stories by citing more sources. Cambodia follows with an average of 2.50 sources. Fewer sources were detected in Indonesia (2.18), Philippines (2.22), Thailand (2.30) and Malaysia (1.65).

A chi-square test was performed to determine whether the six countries differed in the sources cited. The results, shown in Table 7, indicate significant difference in the number of times the following sources were mentioned: multinational corporations and their subsidiaries [$\chi^2(5)=22.914, p<0.00$], international advocacy groups like Greenpeace [$\chi^2(5)=20.799, p<0.00$], government institutions and employees [$\chi^2(10)=37.591, p<0.00$], news wires and other news agencies [$\chi^2(5)=39.095, p<0.00$].

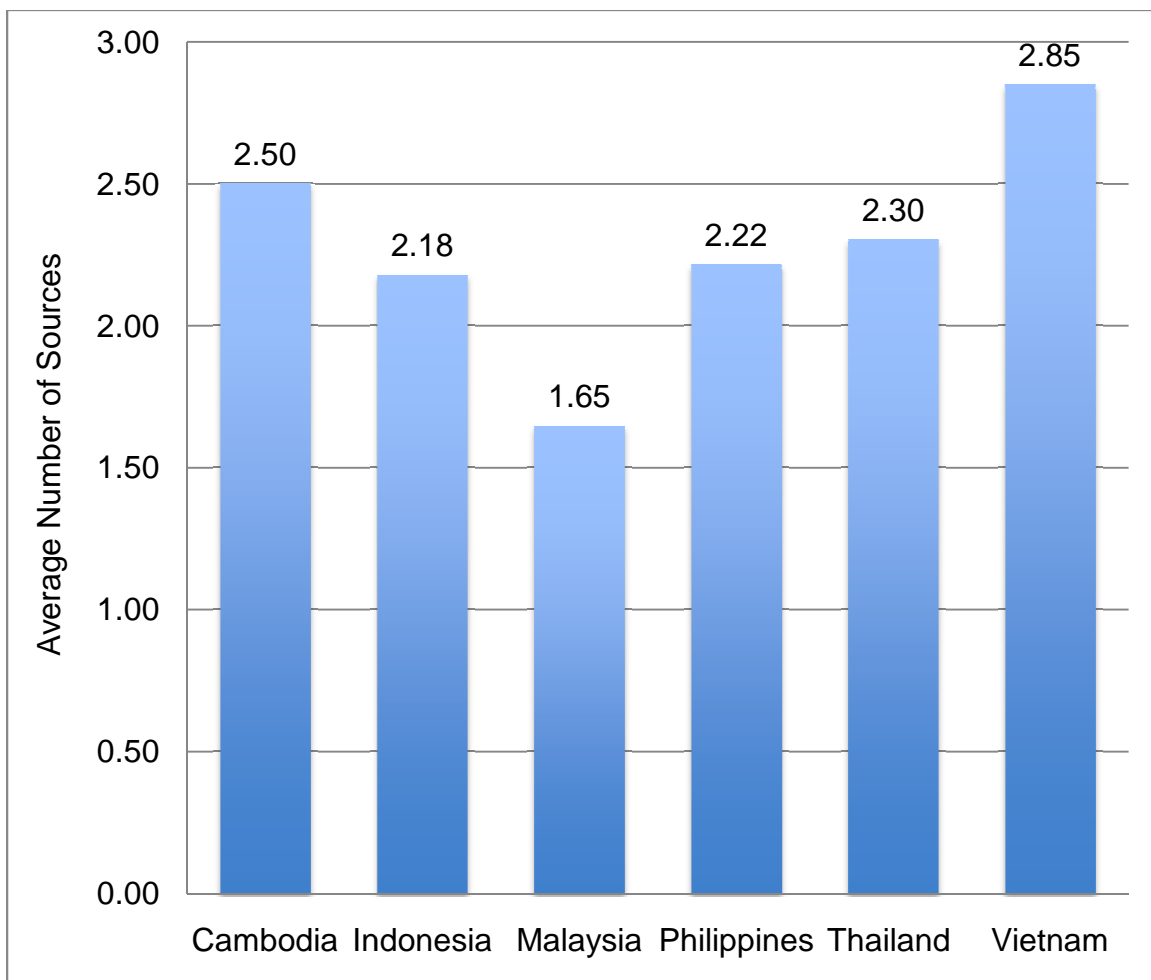


Figure 7. Average number of sources cited per country

Table 7. Chi-square test comparing the difference among the six SE Asian countries in terms of the sources cited in the newspapers' GM coverage

	Country						χ^2	df	Asymp. Sig. (2-sided)
	Cambodia	Indonesia	Malaysia	Philippines	Thailand	Vietnam			
University scientists	0	13	1	30	54	5	5.777	5	0.328
Scientific journals	0	0	0	3	4	0	1.416	5	0.923
Multinational corporations	1	13	0	20	19	0	22.914	5	0.000
Food industry	0	3	2	21	54	4	9.287	5	0.098
Ordinary citizens	1	3	1	7	17	2	3.821	5	0.576
International advocacy groups	3	5	2	53	113	6	20.799	5	0.001
Local NGOs	3	15	2	69	87	2	11.028	5	0.051
International development organizations	2	12	2	21	35	3	8.276	5	0.142
Politicians and government institutions	3	25	10	102	203	18	37.591	0	0.000
Farmers and farmer groups	1	7	0	24	47	3	3.498	5	0.624
News wires and other news agencies	0	4	0	5	5	5	39.095	5	0.000
International government institutions	0	7	2	16	26	1	4.193	0	0.938
Others (e.g., the religious sector, lawyers)	1	15	2	60	64	6	14.356	0	0.157

Press Freedom as a Determinant of Newspaper Performance

Was newspaper performance affected by the state of press freedom in the six countries? A multivariate analysis of covariance (MANCOVA) was conducted to determine whether degree of press freedom influenced coverage intensity (number and length of stories), number of themes, and number of sources cited in the stories. Time, in terms of the year the policy pronouncement became obvious and the year when a country received a specific press freedom rating, was used as the covariate. The number of stories per country and length of words were counted and averaged per year per country. The number of themes and number sources were measured by counting all the identified themes and sources per article, respectively.

The MANCOVA revealed significant multivariate main effects for press freedom [Pillai's trace=0.211, $F(4, 100)=2.95$, $p<.024$, partial eta squared=.106, power=.773]. Given the significance of the overall test, the univariate main effects were examined. The results, shown in Table 8, suggest significant univariate main effects of press freedom on number of articles per year for each country [$F(2, .374)=6.144$, $p<.004$, partial eta squared=.197, power=.871]. Non-significant univariate main effects for press freedom were obtained for the length of articles [$F(2, .011)=.360$, $p>.699$, partial eta squared=.014, power=.105].

As shown in Table 9, significant pair-wise differences in number of stories per year were obtained for countries with a free (mean=28.56) and not free (mean=2.59) press status as well as a partly free (mean=11.46) and not free press status. This indicates that more stories can be seen in a country whose press system has been generally rated as free (like the Philippines) than in countries with press systems that

are consistently rated as not free, such as Vietnam and Malaysia, a finding that follows the expected direction.

Table 8. Results of a multivariate analysis of covariance test showing the influence of press freedom on number of stories and average length of stories

Source	Dependent variable	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared	Obs. power
Press freedom	Number of stories	.749	2	.374	6.144	.004	.197	.871
	Average length	.022	2	.011	.360	.699	.014	.105

Table 9. Means and standard deviations for number of stories and average length of stories

	Press freedom	Mean	Std. dev.	N
Number of stories	Free	28.56	15.54	9
	Partly free	11.46	14.80	28
	Not free	2.59	1.58	17
	Total	11.52	14.96	54
Average length	Free	581.73	152.54	9
	Partly free	598.61	253.83	28
	Not free	728.29	373.74	17
	Total	636.62	287.18	54

Another MANCOVA revealed significant multivariate main effects for press freedom [Wilk's lambda=0.985, $F(4, 1234)=2.416$, $p<.047$, partial eta squared=.008, power=.697] on frame use. Given the significance of the overall test, the univariate main effects were examined. The results, shown in Table 10, suggest significant univariate main effects of press freedom on number of frames used [$F(2, .042)=3.739$, $p<.024$, partial eta squared=.012, power=.684]. As the findings in Table 10 indicate, non-significant univariate main effects for press freedom were obtained

for number of sources [$F(2, .100)=2.155, p<.117, \text{partial eta squared}=.007, \text{power}=.442$].

Shown in Table 11 are significant pair-wise differences in number of frames obtained for countries with a free (mean=3.98) and partly free (mean = 3.99) press status. More frames were discerned from countries with a partly free status, such as Thailand (in 1998, 2003-2004, 2011) and the Philippines (in 2004-2011). This indicates the greater likelihood of more frames employed in a country with a partly free press system than in one that is rated free, a result that appears counter-intuitive although it supports Xiang's (2007) finding that frequency of frame use according to press freedom does not follow a linear pattern. She observed that China (not free) outperformed Thailand (partly free) in the use of the political, economic, and science frames in its coverage of GM rice from 2001 to 2007. Indeed, there was no difference in the number of frames used between countries with a free and not free press status as indicated by the similar distribution of frames in countries under these two press conditions. Likewise, no differences were revealed for countries with not free and partly free status.

Table 10. Results of a multivariate analysis of covariance test showing the influence of press freedom on number of frames used and sources

Source	Dependent variable	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared	Obs. power
Press freedom	Frames	.085	2	.042	3.739	.024	.012	.684
	Sources	.200	2	.100	2.155	.117	.007	.442

Table 11. Means and standard deviations for number of sources and number of frames used in countries with differing press freedom status

	Press freedom	Mean	Std. dev.	N
Number of frames	Free	3.98	1.048	257
	Partly free	3.99	.963	321
	Not free	3.84	.914	44
	Total	3.98	.995	622
Number of sources cited	Free	2.16	1.039	257
	Partly free	2.34	1.081	321
	Not free	2.34	1.346	44
	Total	2.27	1.087	622

A chi-square test was conducted to determine the association of press freedom with tone. The results, displayed in Table 12, show no statistical difference among the six countries in terms of tone of coverage ($X^2=6.719$, $df=4$, $p>.151$), a finding that contradicts that of Xiang (2007) who observed that the more press freedom a country enjoys, the greater the incidence of stories that are negatively disposed toward genetic engineering.

Table 12. Chi-square test showing differences in tone of coverage according to a nation's degree of press freedom

Press freedom rating	Negative	Neutral	Positive	Total	Chi-square	df	Asymp. sig. (2-sided)
Free	126	108	23	257	6.719	4	.151
Partly free	164	123	34	321			
Not free	14	25	5	44			
Total	304	256	62	622			

National Biotech Policy as Determinant of Newspaper Performance

Does a country's official attitude toward GM technology as exemplified in policy pronouncements have a bearing on the way newspapers covered this issue? A MANCOVA test was conducted to answer this research question again using year as a covariate. The results revealed non-significant multivariate main effects for policy and number of stories per country per year and average length of stories per country [Pillai's trace= 0.254, $F(10, 94)= 1.368$, $p>. 0.207$, partial eta squared=0.127, power=0.66].

However, the results, shown in Table 13, revealed significant multivariate main effects for policy [Pillai's trace= 0.031, $F(10,1230)= 1.933$, $p<.037$, partial eta squared=.015, power=.875] on number of sources cited. Given the significance of the overall test, the univariate main effects were examined. Significant univariate main effects for policy was detected for number of sources [$F(5, .147)=3.203$, $p<.007$, partial eta squared=.025, power=.887]. Non-significant univariate main effects were obtained for number of frames [$F(5, .006)=.541$, $p<.745$, partial eta squared=.004, power=.201] (Table 13).

Table 13. Results of multivariate analysis of covariance tests showing the influence of national biotech policy on story length, number of frames used and sources cited

Source	Dependent variable	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared	Obs. power
Policy	Frames	0.031	5	.006	.541	.745	.004	.201
	Sources	0.733	5	.147	3.203	.007	.025	.887

A comparison of means shows that fewer sources tend to be cited by the publications of countries with permissive-precautionary policies (2.02) compared to those in countries with promotional (2.42), promotional-permissive (2.80), precautionary-permissive (2.31), and precautionary (2.28) policy stances (Table 14). The finding suggests that more promotional-permissive policies tend to foster a climate of more free-wheeling debate as evidenced by the presence of more points of view regarding the benefits and perceived risks attendant to the new technology.

Table 14. Means and standard deviations for number of sources and number of frames used in countries according to biotechnology policy

	Policy	Mean	Std. dev.	N
Number of frames used	Promotional	3.95	1.037	77
	Promotional-permissive	3.60	.894	5
	Permissive-neutral	3.82	.856	107
	Precautionary-permissive	4.20	1.206	106
	Precautionary	3.96	.939	325
	Preventive	4.50	2.121	2
	Total	3.98	.995	622
Number of sources cited	Promotional	2.42	1.271	77
	Promotional-permissive	2.80	.837	5
	Permissive-neutral	2.02	.990	107
	Precautionary-permissive	2.31	1.116	106
	Precautionary	2.28	1.048	325
	Preventive	3.50	2.121	2
	Total	2.27	1.087	622

Another chi-square test shows that the tone of coverage differs by the type of biotechnology policy. The results, displayed in Table 15, show a significant difference among the six nations in terms of tone of coverage ($X^2=22.21$, $df=6$, $p<.001$). As expected, countries with a precautionary policy were likely to have more negative to neutral stories about GM. During 2001, 2004, 2005, 2009 and 2010, Indonesia had precautionary policies that included stricter biosafety regulations because of perceived scientific uncertainties engendered by a relatively nascent innovation. Specifically, the Ministry of Agriculture's Decree No. 107/2001, issued on February 6, permitted the limited release of the transgenic cotton commercially named Bollgard in seven regencies in South Sulawesi, Indonesia (*Jakarta Post*, 2001). NGOs maintained that the decree was hastily issued and careless, neglecting the potential consequences of the use of transgenic products, and alleging that the government has not been transparent in making decisions. Moreover, advocacy groups questioned the safety of GM in the absence of official inspections. Critics also lauded the country's official adoption of the precautionary principle regarding biotechnology. Thus, it can be said that precautionary policies tend to sway the coverage toward a negative tone. For all six countries, subscribing to the Cartagena protocol was a clear indication of the adoption of the precautionary principle. The protocol mandated regulations that limit the entry and field trial of GM crops. Across these countries, the results suggest that the more precautionary policies a country has, the greater incidence of negative stories toward GM. Government ambivalence about GM crop commercialization also may have stirred more opposing views.

Table 15. Chi-square test showing differences in tone of coverage according to biotechnology policy

Policy	Negative	Neutral	Positive	Total	Chi-square	df	Asymp. sig. (2-sided)
Promotional	35	33	9	77	22.211	6	.0011
Permissive-neutral	69	24	14	107			
Precautionary-permissive	52	41	13	106			
Precautionary	145	154	26	325			
Total	301	252	62	615			

* The following policy types: promotional-permissive and preventive were excluded from the analysis due to cell counts less than 5.

To summarize, results reveal that press freedom has an influence on the number of stories published per year in each country and the number of frames used in the articles. Specifically, a freer press status fosters a more intense coverage and a more robust debate as evidenced by the application of more frames. However, press freedom showed no impact on the average length of stories published in each country on an annual basis and the number of sources cited. No association was found between press freedom and tone of coverage.

National biotech policy showed no influence on the number and average length of stories as well as on the number of frames detected. However, biotech policy was shown to have a strong bearing on the number of sources cited in the stories and was statistically associated with tone of coverage. That is, countries proclaiming a more precautionary policy tended to allow multiple source citations, and had a greater tendency to produce a more polarized coverage.

CHAPTER 5. CONCLUSIONS

This study addressed the call for a wider application of communication theories in different milieus by examining the performance of Southeast Asian newspapers in covering genetic engineering and GM crops. It aims to determine the influence of biotechnology policy and press freedom status in six countries on media performance. In this study, performance was measured in terms of coverage intensity (the number and length of stories about the topic published over a 15-year time span), the frames used, frame frequency and intensity, tone or valence of coverage, and the sources of information cited. The propositions of second-level agenda setting and framing theories served as guides for analysis.

Over a 15-year period, the intensity of coverage of GM crops can be considered moderate to weak, having been the subject of only 622 stories in the six newspapers combined. The length of these stories, however, can be characterized as relatively long (average=610 words). Thailand and the Philippines produced the most number of stories (323 and 200, respectively) with an average length of a little more than 500 words. Fifty-six GM-related articles saw print in the Indonesian newspaper although these stories were considerably longer (average=657 words). Cambodia (six articles, 425 words), Malaysia (17 stories, 987 words) and Vietnam (56 articles, 657 words) gave less attention to GM crops.

The second level agenda-setting theory states that mass media effects go beyond the ability to goad audience members to assign salience to issues based on their exposure to mass media content. The intensity and nature of coverage,

according to the theory, help shape people's understanding of the most important issues of the day. The frames the media use to inform the public about a topic serve to characterize and diagnose problems, help audiences make moral judgments about the situation, and suggest solutions to identified problems or concerns.

Unlike in the US wherein economic frames dominated the reporting of GM papaya (Xiang, 2007), the findings of the current study show the overwhelming presence of safety and policy/legal issues in GM coverage across the six nations. With the exception of the Vietnam newspaper, all touched upon the uncertainties associated with GM crops, including those related to its alleged potential adverse effects on human health. The articles also demonstrated a high level of uneasiness over pollen flow, or the genetic contamination of traditional and indigenous crop varieties. These concerns over the impact of GM technology on biodiversity often lead to discussions about how to alleviate the perceived threat. These measures include establishing more stringent biosafety regulatory frameworks. A few articles highlighted research and development efforts that point to a nation's political slant toward GM crops.

In general, the tone of the stories was negative to neutral toward GM crops. After more than a decade of biotechnology coverage, the Thailand newspaper exhibited some maturity in its reporting. Despite occasional event-oriented and highly sensationalized stories, the *Bangkok Post* demonstrated objectivity and balanced reporting by releasing more stories neutral toward genetic modification. The *Post* also displayed a marked preference for institutional sources of information.

The most negative coverage was observed in the Philippine newspaper, suggesting its vulnerability to the perspectives of vocal politicians and anti-GM groups. The deployment of negative frames was fostered by the prominence of government officials, advocacy groups, and members of the religious sector who question GM technology on moral and ethical grounds in the news reports.

The social amplification of risk framework sees the mass media as an arena in which various stakeholders compete for public attention and acceptance of their points of view. In this study, politicians and government institutions were highly cited in the newspaper coverage. Next were international advocacy groups and local NGOs who had very strong opinions about the disadvantages of genetic modification. Their recurring presence in the debate explains the negative to neutral tone in the coverage of the GM stories in the *Philippine Daily Inquirer*. Though scientists were also cited, the more polarized views of partisan politicians along with the active lobbying of environmental groups trampled the more scientific perspectives about GM.

To further understand the role of socio-cultural factors in shaping media performance, two independent variables—the influence of a country's press freedom and biotech policy—were investigated. The results of statistical analyses indicate that press freedom influences the number of stories published about the issue and the number of frames employed in those stories. The findings show that the newspapers in countries that have been generally considered as free (like the Philippines) tend to publish more stories compared to those in countries consistently rated not free (such as Malaysia and Vietnam). Also, nations consistently rated not

free tended to publish fewer stories than countries with a generally partly free status (such as Indonesia).

Countries known to be partly free exhibited the greater frame use. Indonesia, with a press system assessed as partly free, made use of more frames than the Philippines with a press system that varied from free to partly free. However, no statistically significant association was found between press freedom and tone of coverage.

The findings also show that biotech policy is more likely to influence number of sources cited but not the number of themes or frames used. That is, more precautionary policy postures tended to support the use of more sources of information. There was a statistically significant association found between biotech policy and tone of coverage. In this case, more precautionary policies tended to produce a more polarized coverage.

Implications of the Findings to Theory and Professional Practice

The results show the range of forces that influence the framing of the GM debate, and the fundamental role of the media as the venue where opposing views about GM technology compete for public acceptance and support. The robust debate about genetic engineering has produced multiple frames reporters exploited to explain a multi-faceted issue. As a contextual factor, press freedom had a notable influence in the number of stories published and the number of frames journalists used to inform the public about this innovation. No discernible influence on frame use, however, was detected for biotech policy. A nation's policy posture was shown to have a bearing on the intensity of source use and tone of coverage.

Over the years, activists and critics have used fear appeals to draw public attention and enhance citizens' awareness by emphasizing the health and environmental risks perceived as being attendant to GM technology. They also stressed the moral dimension of this innovation by privileging the voices of those who suggest that genetic alteration is inherently unnatural and is thus likely to produce catastrophic consequences. What these frames suggest is that GM technology has ceased being a purely scientific issue; it has been transformed into a social-political one. While the normative dimension of risks mirrored in the frames constitute important information items, coverage across the region provided little scientific information as scientists were overshadowed by politicians and advocacy groups as information sources.

The findings indicate the active role politicians and government officials play in shaping frame use and tone of coverage. Traditionally, the perspectives of these sources are often sought because of their assumed authority and ascribed credibility. The strong presence of international advocacy groups and local NGOs in news reports suggests that political figures are not the only players in this arena. Environmental groups and local NGOs are key information sources with the propensity to counter scientific claims.

Notably absent are frames that give voice to farmers' concerns. What are their intentions toward GM products? Do they take their cues from those who have tested GM seeds in their fields? The almost negligible reference to farmers as information sources adds to the disproportionate weight given to the viewpoints of politicians who probably do not know the first thing about farming.

Across the board, the most frequently cited sources were politicians and government officials perhaps because of their accessibility to the news media. The stiff deadlines for filing news reports often prompt reporters to resort to the so-called “elite sources” (such as government officials) who are readily available for facts, opinions and interpretations. Reporters often seek government sources in situations that engender public protests because events can unfold rapidly and audiences must be reached quickly. Indeed, study after study have shown that they dominate the source menu of journalists even for issues that have strong scientific or technical underpinnings, but about which they often have little training.

Although political figures may be appropriate spokespersons or “point agencies” for political issues, economic topics and foreign affairs, they may not be the best sources of information, commentary and interpretation in the coverage of new technologies. The dominance of politicians as sources of information, particularly in science reports and in the coverage of health or environmental risk, places the quality of such news reports in question. The likelihood is high that, lacking credentials and expertise, such sources can misinform the public by coloring facts or scientific statements with political opinion.

There is broad consensus at the international level that GM foods are as safe as conventional foods (Chassy, 2008). The newspapers, however, were unaware of this development considering the persistent presence of food safety frames particularly related to potential adverse effects on human health.

The dominance of safety issues detracted the newspapers from reporting on the potential for the GM seed-owning multinational corporations to dominate the

seed market. Health-related concerns also took journalists' attention from the economic impact of GM crops on the domestic economy, especially on farmers and local farming practices.

The newspapers' coverage also failed to examine second-generation problems related to the growing of GM crops, such as the development of resistance to pest and weeds, another indication that scientific issues were overshadowed by unwarranted claims about adverse health effects.

Limitations of the Study and Suggestions for Future Research

While this study yielded findings with implications to theory and practice, it has several limitations. First, the study analyzed only English-language newspapers in the six countries that are generally non-English speaking. Examining GM coverage in newspapers issued in their local languages may show different frames than those of English-language newspapers that normally target a nation's elite.

Second, the study included only one newspaper from each country, a sampling choice that severely limits the generalizability of results. A sample composed of more than one newspaper from each country may reveal more local trends in the reporting of genetic modification.

Third, GM crops have only been popularized recently in some countries like Vietnam and Malaysia, while new GM varieties continue to be developed in Thailand, the Philippines, and Indonesia. This suggests that a longer time frame of analysis is appropriate to give a full account of the trajectory of coverage and to characterize news content over time.

Fourth, there are other factors that may have an influence on media frames that were unaccounted for in this study. Among others, culturally-bound journalistic routines, the individual characteristics of science reporters, and the strength of science reporting in a given country must have a bearing on the intensity and variety of frames newspapers employ. Likewise, it may be helpful to test the applicability of Hofstede's (1980) cultural dimensions in the Southeast Asian context. Of particular interest may be a cross-cultural comparison of journalists' ability to adapt to changes and deal with ambiguity.

Fifth, crops are genetically modified to express desired traits for a variety of purposes, such as for food, feed, fuel, fiber, and pharmaceuticals. This study did not delineate the frames applied depending on the crop's function. Future studies can examine whether frames are different for food and non-food GM crops.

Sixth, this study examined media frames exclusively as a dependent variable. Beyond this, it is essential to explore media frames as an independent variable and evaluate its impacts on audience frames. The results of a content analysis are, by nature, limited to an evaluation of media performance. Future studies could endeavor to match the content analysis results with those of public perceptions that can be obtained through survey data. More studies that examine the impact of frames on audiences' cognitions, attitudes, and behavioral intentions will provide stronger evidence for the strength of framing as a theoretical framework.

Seventh, one of the strengths of framing analysis as a mechanism to understand news media coverage of issues is that it creates discrete categories of classification and measurement. However, the presence of more than one frame in a

story requires more astuteness in assigning dominance to one frame over the next. Future studies should focus on how to resolve this methodological difficulty.

Future studies should be able to disaggregate the strength of the contributions of different media in the shaping of audience frames. Such studies can compare the performance of the online media, which have been increasingly exerting its force especially among young audiences across the globe, against those of the traditional media such as newspapers, TV, and radio specifically in terms of their ability to communicate scientific and technological breakthroughs.

PRESS FREEDOM SCORES FROM 1996 TO 2011

	1996		1997		1998		1999		2000		2001		2002		2003	
	Score	Status	Score	Status	Score	Status	Score	Status	Score	Status	Score	Status	Score	Status	Score	Status
Cambodia	65	NF	65	NF	65	NF	62	NF	61	NF	61	NF	68	NF	64	NF
Indonesia	74	NF	77	NF	77	NF	53	PF	49	PF	47	PF	53	PF	56	PF
Malaysia	61	NF	61	NF	61	NF	66	NF	70	NF	70	NF	71	NF	71	NF
Philippines	46	PF	46	PF	30	F	30	F	30	F	30	F	30	F	30	F
Thailand	31	PF	34	PF	31	PF	30	F	30	F	29	F	330	F	36	PF
Vietnam	68	NF	69	NF	71	NF	71	NF	75	NF	80	NF	82	NF	82	NF

	2004		2005		2006		2007		2008		2009		2010		2011	
	Score	Status	Score	Status	Score	Status	Score	Status	Score	Status	Score	Status	Score	Status	Score	Status
Cambodia	63	NF	62	NF	61	NF	58	PF	60	PF	61	NF	61	NF	63	NF
Indonesia	55	PF	58	PF	58	PF	54	PF	54	PF	54	PF	52	PF	53	PF
Malaysia	69	NF	69	NF	65	NF	68	NF	65	NF	65	NF	64	NF	64	NF
Philippines	34	PF	35	PF	40	PF	46	PF	45	PF	45	PF	48	PF	46	PF
Thailand	39	PF	42	PF	50	PF	59	PF	56	PF	57	PF	58	PF	62	NF
Vietnam	82	NF	82	NF	79	NF	77	NF	82	NF	83	NF	82	NF	83	NF

APPENDIX B

CODE BOOK: THE EFFECTS OF PRESS FREEDOM AND BIOTECH POLICY ON SOUTHEAST ASIAN NEWSPAPERS' COVERAGE OF GENETICALLY MODIFIED CROPS

No.	Variable name	Variable label	Codes and coding protocols	Actual code	Missing values
1	ID	Article ID number	Enter ID number		
2	Title	Article Title	Enter as text		
3	Country	Country where newspaper is published	1 = Cambodia 2 = Indonesia 3 = Malaysia 4 = Vietnam 5 = Thailand 6 = Philippines		
4	Date	Date of publication	Enter as mm-dd-yy		
5	Type	Type/characteristic of article	1 = straight news 2 = feature 3 = editorial/opinion page 4 = reader's comments/letter to the editor or newspaper		
6	Author	Author or contributor of the story	1= story written by newspaper reporter or staff writer 2= reader's response or letters 3= other		
7	Length	Length of article in number of words	Enter as numerical value		
8	Theme1	The first detected frame or main focus discussed in the article	1 = safety issues related to human, animal and environmental health benefits; 2 = food security issues, including the ability or inability of GM crops to address hunger, malnutrition, disease, poverty, social stability, sustainability or self-sufficiency; 3 = the economic dimension of GM crops, including existing and potential markets, impact on the stock market, industrial and agricultural growth, reaction of		
	Theme2	The second detected frame			
	Theme3	The third detected frame			
	Theme4	The fourth			

		detected frame (if any)	investors, and implications for the domestic economy;		
	Theme5	The fifth detected frame (if any)	<p>4 = the legal issues related to GM technology, including government policies, ownership of intellectual property (especially patenting), biosafety protocols and government regulation of development and distribution;</p> <p>5 = controversy, dispute or debate (i.e., moral and ethical implications of genetic engineering, the advantages and disadvantages of GM crops vis-à-vis non-GM agricultural products; and</p> <p>6 = public protests against GMOs (i.e., public demonstrations against trials or commercialization of genetically modified organisms, demonstrators on the streets and other public spaces, anti-GE campaigns);</p> <p>7 = presence of GMOs in the country (i.e., import and export of GM crops and the availability of GM crops in the market);</p> <p>8 = research and development (i.e., basic and applied research, field testing, biosafety trials, and commercialization);</p> <p>9 = monopoly of multinational corporations;</p> <p>10 = other themes.</p>		
	Theme6	The sixth detected frame (if any)			
	Theme7	The seventh detected frame (if any)			
	Theme8	The eighth detected frame (if any)			
9	Valence	Tone or orientation of the article toward GM crops	<p>0= negative</p> <p>1= neutral</p> <p>2= positive</p>		

10	Sources	Individuals or groups cited in the articles	<p>1 = scientists, professors or researchers from government or non-government universities and research centers or institutions (e.g., senior researcher at the Bogor Institute of Agriculture;</p> <p>2 = scientific journals and publications, including their editors;</p> <p>3 = representative of multinational corporations that produce GM seeds, such as Monsanto, Pioneer and Syngenta and their subsidiaries;</p> <p>4 = members of the food industry and their associates (e.g., Vietnam Food Association) ;</p> <p>5 = ordinary citizens and consumers, but not farmers;</p> <p>6 = international advocacy groups (e.g., Greenpeace, Friends of the Earth, Union of Concerned Scientists);</p> <p>7 = local or regional NGOs, excluding Greenpeace and the like (e.g., Cambodia's Biodiversity Enabling Activity, Indonesian Consumers Organization);</p> <p>8 = International development groups (e.g., the United Nations and its affiliate agencies) and international financial institutions (e.g., World Bank, Asian Development Bank);</p> <p>9 = politicians and government employees except government scientists;</p> <p>10 = farmers and farmers associations;</p> <p>11 = local and international news</p>		
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			outlets and news agencies (e.g., Vietnam News Agency, Saigon Times Daily) and wire agencies (e.g., Reuters, AFP, AP); 12 = others, including religious leaders, lawyers and unnamed experts or authorities.		
11	Free	Freedom House press freedom ranking for that year	1= free 2= partly free 3= not free		
12	Policy	National biotechnology policy	1= promotional 2= promotional & permissive 3 =permissive or neutral 4= precautionary & permissive 5= precautionary 6= preventive		

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